

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
ABANDONED HARDROCK MINE PRIORITY SITES**

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**SUMMARY REPORT**







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**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU**

**ABANDONED HARDROCK MINE PRIORITY SITES  
1995  
SUMMARY REPORT**

**Prepared For:**

**Montana Department of State Lands  
Abandoned Mine Reclamation Bureau  
1625 Eleventh Avenue  
Helena, Montana 59620**

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**Engineering Services Agreement DSL-AMRB No. 94-006**

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## **1.0 INTRODUCTION**

This document is a compilation of the 1993 and 1994 Hazardous Materials Inventory Summary Reports published by the Montana Department of State Lands/Abandoned Mine Reclamation Bureau (MDSL/AMRB). The Hazardous Materials Inventory was implemented to consistently characterize and rank the extent of environmental problems associated with the Abandoned Hardrock Mine Priority Sites.

The Hazardous Materials Inventory involved the investigation of 269 abandoned or inactive hardrock mine sites in 1993 and an additional 62 mines sites in 1994. This report summarizes the findings of 276 sites from the total 331 sites investigated. Fifty-five sites were dropped from the Abandoned Hardrock Mine Priority Sites list due to a lack of significant environmental hazards associated with the sites. The dropped sites are discussed in Section 4.0.

This report is organized into five sections. Section 1.0 presents the introduction, project objectives, a brief description of the project tasks, and a summary of the findings. Section 2.0 briefly describes field methods used during the inventory. Section 3.0 discusses data evaluation techniques and data management for the project. Section 4.0 presents a brief description of the Abandoned and Inactive Mines Scoring System (AIMSS), which was developed to rank the priority sites. Section 5.0 presents one-page summaries for each priority site. The summaries provide site-specific information, including volumes of wastes, contaminant concentrations, observed releases to surface water and groundwater, water quality criteria exceedances, and potential safety hazards.

This summary report is supported by several other project documents and databases, including:

- The Sampling and Analysis Plan (SAP) presents the sampling approach for the Abandoned Mines Hazardous Materials Inventory. This SAP also contains instructions on completing the Inventory Form and the Standard Operating Procedures (SOPs) for conducting the field sampling activities (AMRB/Pioneer, 1993a and 1994a).
- The Quality Assurance Project Plan (QAPjP) describes quality assurance procedures used for evaluating the field and laboratory data for the project (AMRB/Pioneer, 1993b and 1994b).
- The Laboratory Analytical Protocol (LAP) describes laboratory requirements for the project (AMRB/Pioneer, 1993c and 1994c).
- The Health and Safety Plan (HSP) describes practices and procedures to be followed by field investigators to minimize exposure to hazardous materials and to eliminate any possibility of physical injury (AMRB/Pioneer, 1993d and 1994d).



- The Abandoned Hardrock Mines Project Report is a compilation of the reports listed on the previous page, as well as this Summary Report, the AIMSS Report, the Data Validation/Evaluation Report, and the completed Hazardous Materials Inventory Forms for each site (AMRB/Pioneer, 1993e and 1994e).
- The Abandoned Hardrock Mine Priority Sites, Hazardous Materials Inventory Databases are database files containing all of the data collected from the 1993 and 1994 inventories.

The complete Abandoned Hardrock Mines Project Report including the 1993 and 1994 inventories can be viewed in Helena, Montana, at the Montana State Library; the MDSL/AMRB office; or the Montana Department of Health and Environmental Sciences/Solid and Hazardous Waste Bureau (MDHES/SHWB) office or in Missoula, Montana, at the United States Department of Agriculture/Forest Service (USFS), Region 1 office.

## **1.1 PROJECT OBJECTIVES**

An estimated 6,000 abandoned or inactive hardrock mine and milling sites exist in Montana. This legacy of Montana's mining past has left a wide range of problems and challenges for the MDSL/AMRB and other state and federal agencies charged with reclaiming and mitigating of these problems.

The various problems associated with the abandoned and inactive hardrock mine sites range from safety hazards caused by hazardous mine openings, dangerous highwalls, and dilapidated structures to threats to human and non-human life and the environment by mining waste containing elevated heavy metals and other contaminants. To date, the MDSL/AMRB has worked to eliminate the problems of unsafe openings, highwalls, and structures and has made over 1,500 of these sites safer.

In 1991, the MDSL/AMRB concluded that substantial progress had been made in eliminating imminent hazards to public health and safety at abandoned hardrock mine sites. However, limited progress was realized regarding heavy metal and mineral processing reagent contamination of surface water and groundwater. Not only were these sites causing severe environmental degradation, but they were also the sites of highest public concern. Additionally, the MDSL/AMRB recognized a number of other state and federal programs that had resources available to address their problems but that there was no coordinated approach to determine which specific sites should be addressed first. As a result, the MDSL/AMRB solicited various state and federal agencies and requested assistance in identifying of suspected problem sites. The following agencies responded to the MDSL/AMRB's request: USFS-Region 1, the United States Department of the Interior/Bureau of Land Management (BLM), MDHES, and the Montana Department of Natural Resources and Conservation (DNRC). A list of the 269 suspect sites was compiled from the input of these agencies supplemented by a review of existing data from the MDSL/AMRB master inventory. This list included 269

of the highest potential hazard sites in Montana and these sites were investigated and inventoried during the 1993 field season. As a result of the 1993 inventory activities and continued records searches, 62 additional sites were identified, investigated, and ranked during the 1994 field season by the MDSL/AMRB. Of the 331 sites investigated, 55 sites were removed from the list due to a lack of significant environmental hazards (Section 4.0). A list of the remaining 276 sites is presented in Table 1-1.

The agencies previously listed agreed to a cooperative course of action, with MDSL/AMRB designated as the lead agency. The agencies established the following objectives:

- To identify and prioritize the abandoned mine sites that presently pose the most threats to public health and safety and the environment.
- To consistently collect data on each priority site to identify problems associated with each site and to directly compare and rank sites. All sampling and analysis methods strictly follow United States Environmental Protection Agency (EPA) protocols to ensure consistent and accurate results.
- To develop a long-term strategy using statutory and financial resources available to systematically reduce the hazards associated with the prioritized abandoned mine sites.

Once this report is completed, the first two objectives stated above will be fulfilled, and the framework to complete the third objective will be in place.

## **1.2 PROJECT DESCRIPTION**

The priority sites investigated during the 1993 and 1994 field seasons under the Hazardous Materials Inventory were located in 23 counties and in 88 of the 206 mining districts in Montana. Site investigations conducted in 1993 and 1994 required 145 field days to collect the data.

The site investigation conducted at each site involved: overall site reconnaissance; mapping; collection of tailings, slag, waste rock, adit discharge, flooded shafts, stream water, and sediment samples; field analysis of solid matrix samples using an X-ray Fluorescence (XRF) Spectrometer; and measurements of field parameters in water, including flow rates, pH, specific conductance, temperature, oxidation reduction potential, and alkalinity. The field team members also photographed sample locations and significant site features, video taped the site, and evaluated safety hazards.

The 1993 field investigations were conducted in abnormally wet conditions. There were 69 days of measurable precipitation with a total accumulation of 11.2 inches of precipitation (measured in Butte, Montana). During the 1994 investigation period, there

TABLE 1-1: ABANDONED HARDROCK MINE PRIORITY SITES LIST

COUNTY	DISTRICT	SITE NAME	P.A. NO.
Beaverhead	Barnack	Apex Millsite	01-006
Beaverhead	Barnack	Gold Leaf/Priscilla	01-031
Beaverhead	Birch Creek	Indian Queen	01-034
Beaverhead	Elkhorn-South	Old Elkhorn	01-169
Beaverhead	Ermont	Ermont Mines/Millsite	01-005
Beaverhead	Heda	Silver King	01-094
Beaverhead	Heda	True Blue	01-138
Beaverhead	Heda	Upper & Lower Cleve	01-143
Beaverhead	Heda	Trapper	01-144
Beaverhead	Lemhi Pass	Last Chance No. 1/IER	01-216
Beaverhead	Lost Creek	Tungsten Millsite	01-170
Beaverhead	Wisdom	Clara	01-262
Beaverhead	Wisdom	Martin	01-270
Broadwater	Confederate	Miller Mountain	04-138
Broadwater	Hellgate	Argo Mine/Millsite	04-015
Broadwater	Indian Creek	Park (Marietta)	04-012
Broadwater	Indian Creek	St. Louis	04-013
Broadwater	Indian Creek	Diamond Hill	04-020
Broadwater	Indian Creek	Bullion King	04-081
Broadwater	Radersburg	Ohio	04-009
Broadwater	Radersburg	Keating Tailings	04-121
Broadwater	Winston	Custer Millsite	04-006
Broadwater	Winston	East Pacific	04-008
Broadwater	Winston	Kleinschmidt	04-010
Broadwater	Winston	Vosburg	04-014
Broadwater	Winston	Golden Age	04-050
Broadwater	Winston	Sunrise/January	04-130
Broadwater	Winston	Chartam	04-501
Broadwater	Winston	Block P Tailings	07-090
Cascade	Hughesville	Bon Ton	07-094
Cascade	Hughesville	Broadwater	07-079
Cascade	Neihart	Vilpa	07-080
Cascade	Neihart	Hartley	07-082
Cascade	Neihart	Molton	07-084
Cascade	Neihart	Queen of the Hills	07-085
Cascade	Neihart	Evening Star Mine/Millsite	07-087
Cascade	Neihart	Compromise	07-100
Cascade	Neihart	Carpenter Creek Tailings	07-103
Cascade	Neihart	Rochester	07-110
Cascade	Neihart	Silver Belt	07-111
Cascade	Neihart	Fairplay	07-112
Cascade	Neihart	Stallabass	07-120
Cascade	Neihart	Decotah	07-121
Cascade	Neihart	Maud S.	07-129
Cascade	Neihart	Neihart Tailings	07-134
Cascade	Neihart	Silver Dyke Adit	07-135
Cascade	Neihart	Silver Dyke Tailings	07-137

COUNTY	DISTRICT	SITE NAME	P.A. NO.
Cascade	Neihart	Silver Dyke Millsite	07-136
Cascade	Neihart	Sherman No. 2 - SW	07-142
Cascade	Neihart	Emma	07-144
Cascade	Neihart	Big Seven	07-156
Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157
Cascade	Neihart	Ripple Mines	07-163
Cascade	Neihart	Lexington No. 4	07-167
Cascade	Orofino	Champion	12-003
Deer Lodge	Silver Lake	Cable	12-002
Deer Lodge	Silver Lake	Gold Coin Mine	12-004
Deer Lodge	Silver Lake	Silver Lake Millsite	12-070
Fergus	Warm Springs	Gilt Edge Tailings	14-008
Fergus	Warm Springs	Tail Hot	14-010
Fergus	Warm Springs	Cumberland	14-017
Fergus	Warm Springs	Prestor John	14-090
Fergus	Hog Heaven	Flathead Mine	15-012
Gallatin	Bozeman	Karst Asbestos	16-018
Granite	Alps	Alps	20-065
Granite	Alps	Argo	20-081
Granite	Antelope Creek	Silver King	20-186
Granite	Antelope Creek	Lori No. 13	20-191
Granite	Antelope Creek	Ant	20-194
Granite	Combination	Combination Millsite	20-009
Granite	Dunkleburg	Forest Rose	20-004
Granite	Dunkleburg	Wasa	20-023
Granite	Dunkleburg	Jackson Park	20-027
Granite	Frog Pond	Millers Mine	20-176
Granite	Garnet	Free Coin/Red Cloud	20-134
Granite	Maxville	Maxville Tailings (Londonderry)	20-209
Granite	Moose Lake	Banner	20-175
Granite	Moose Lake	Old Dominion	20-180
Granite	Phillipsburg	Bi-Metallic/Old Red	20-002
Granite	Phillipsburg	Douglas Creek Tailings	20-003
Granite	Phillipsburg	Algonquin	20-005
Granite	Phillipsburg	Rumsey Mine/Millsite	20-018
Granite	Phillipsburg	Scratch All	20-019
Granite	Phillipsburg	Trout	20-062
Granite	Phillipsburg	Little Gem	20-071
Granite	Phillipsburg	Wenger No. 2	20-073
Granite	Phillipsburg	Granite Mountain	20-110
Granite	Phillipsburg	True Fissure	20-111
Granite	South Boulder	Nonpareil	20-012
Granite	South Boulder	Brooklyn	20-025
Jefferson	Alhambra	Middle Fork Warm Springs	22-046
Jefferson	Alhambra	Alhambra Hot Springs	22-049
Jefferson	Alhambra	Solar Silver	22-054
Jefferson	Basin	Bullion	22-008

TABLE 1-1: ABANDONED HARDROCK MINE PRIORITY SITES LIST (Cont'd)

COUNTY	DISTRICT	SITE NAME	P.A. NO.
Jefferson	Basin	Josephine	22-031
Jefferson	Basin	Basin Millsite	22-038
Jefferson	Basin	Perry's Park	22-039
Jefferson	Basin	Buckeye	22-072
Jefferson	Basin	Enterprise	22-074
Jefferson	Basin	Doris	22-293
Jefferson	Basin	Jack Creek Tailings	22-296
Jefferson	Basin	Lady Leith	22-316
Jefferson	Basin	Old Basin Millsite	22-500
Jefferson	Catatract	Mantle (East)	22-032
Jefferson	Catatract	Crystal	22-073
Jefferson	Catatract	Eva May	22-075
Jefferson	Catatract	Morning Glory	22-077
Jefferson	Catatract	Crescent/Alsace	22-106
Jefferson	Catatract	Boulder Chief	22-132
Jefferson	Catatract	Rocker/Ada	22-170
Jefferson	Clancy	Neillie Grant	22-244
Jefferson	Clancy	General Grant	22-245
Jefferson	Colorado	Alta	22-001
Jefferson	Colorado	Bertha	22-002
Jefferson	Colorado	Bluebird	22-003
Jefferson	Colorado	Corbin Flats	22-004
Jefferson	Colorado	Gregory	22-005
Jefferson	Colorado	Washington	22-007
Jefferson	Colorado	Crawley Camp	22-028
Jefferson	Colorado	Argentine	22-102
Jefferson	Colorado	Wickes Smelter	22-358
Jefferson	Elkhorn	Elkhorn Queen	22-027
Jefferson	Elkhorn	Queen (Tourmaline)	22-111
Jefferson	Elkhorn	Tacoma	22-284
Jefferson	Elkhorn	Sourdough	22-338
Jefferson	Elkhorn	Camody	22-337
Jefferson	Elkhorn	Iron	22-359
Jefferson	Elkhorn	Trumley Heap Leach	22-501
Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502
Jefferson	High Ore	Comet Tailings	22-009
Jefferson	High Ore	Grey Eagle	22-029
Judith Basin	Hughesville	Block P Mine	23-001
Judith Basin	Hughesville	Marcelline	23-022
Judith Basin	Hughesville	Belt Patent	23-035
Judith Basin	Hughesville	NE NE S7 (Lucky Strike)	23-042
Judith Basin	Hughesville	Wright Lode	23-045
Judith Basin	Hughesville	Edwards Lode	23-046
Judith Basin	Hughesville	Harrison/Moulton	23-056
Judith Basin	Hughesville	Moulton	23-058
Judith Basin	Hughesville	Tiger	23-059
Judith Basin	Hughesville	Danny T	23-500
Lewis & Clark	Helena	Spring Hill Tailings	25-087
Lewis & Clark	Helena	Joslyn Street Tailings	25-501
Lewis & Clark	Lincoln	Seven-Up Pete/Rover	25-020
Lewis & Clark	Lincoln	Blackfoot Tailings	25-322
Lewis & Clark	Marysville	Drumlammon Mine/Mill/Tailings	25-024
Lewis & Clark	Marysville	Bald Mountain	25-081
Lewis & Clark	Marysville	Big Ox Millsite	25-115
Lewis & Clark	Marysville	Big Ox Mine	25-116
Lewis & Clark	Marysville	Belmont	25-167
Lewis & Clark	Marysville	Piegan/Gloster Millsite	25-172
Lewis & Clark	Marysville	Empire Millsite	25-175
Lewis & Clark	Marysville	Bald Butte Millsite	25-179
Lewis & Clark	Marysville	Wildcat	25-317
Lewis & Clark	Marysville	Goldsail Millsite	25-365
Lewis & Clark	Orpahr	Victory/Evening Star	25-010
Lewis & Clark	Rimini	Tennile Mine	25-005
Lewis & Clark	Rimini	Peerless Jenny/King	25-006
Lewis & Clark	Rimini	Red Water	25-007
Lewis & Clark	Rimini	Valley Forge/Susie	25-008
Lewis & Clark	Rimini	Red Mountain (13)	25-019
Lewis & Clark	Rimini	Lower Tennile Millsite	25-030
Lewis & Clark	Rimini	Armstrong	25-102
Lewis & Clark	Rimini	Beatrice	25-103
Lewis & Clark	Rimini	Woodrow Wilson	25-258
Lewis & Clark	Rimini	Peter	25-259
Lewis & Clark	Rimini	Queensbury	25-282
Lewis & Clark	Rimini	Monte Cristo	25-275
Lewis & Clark	Rimini	Upper Valley Forge	25-280/282
Lewis & Clark	Rimini	National Extension	25-287
Lewis & Clark	Rimini	Monitor Creek Tailings	25-503
Lewis & Clark	Rimini	Bear Gulch	25-504
Lewis & Clark	Scratchgravel	Franklin	25-339
Lewis & Clark	Stemple	NE NW S13	25-197
Lewis & Clark	Stemple	Swansea Tailings/Mine	25-208
Lewis & Clark	Stemple	SE SW S10	25-212
Lewis & Clark	Stemple	Astor	25-227
Lewis & Clark	Stemple	Jay Gould Mine/Millsite	25-500
Lincoln	Libby	Snowshoe	27-005
Lincoln	Libby	Cherry Creek Millsite	27-006
Madison	Norris/Red Bluff	Boaz	28-013
Madison	Norris/Red Bluff	Grubstake	28-399
Madison	Pony	Atlantic & Pacific	28-033
Madison	Pony	Boss Tweed	28-034
Madison	Pony	Garnet Gold Mine	28-035
Madison	Pony	Strawberry	28-038
Madison	Pony	Chicago Mining Corp. Pony Mill	28-500
Madison	Rochester	Emma	28-061

TABLE 1-1: ABANDONED HARDROCK MINE PRIORITY SITES LIST (Cont'd)

COUNTY	DISTRICT	SITE NAME	P.A. NO.
Madison	Rochester	Thistle Mine/Millsite	29-073
Madison	Rochester	Watseca	29-075
Madison	Sheridan	Smuggler	29-010
Madison	Sheridan	Goldschmidt-Steiner	29-078
Madison	Sheridan	Red Pine	29-079
Madison	Sheridan	Broadgauge	29-293
Madison	Sheridan	Latest Out	29-354
Madison	Sheridan	Uncle Sam	29-383
Madison	Sheridan	Lakeshore	29-438
Madison	Sheridan	Buckeye	29-451
Madison	Sheridan	SE SW S26 (Keynote)	29-474
Madison	Sheridan	NW SE S26	29-478
Madison	Silver Star	Broadway/Victoria	29-179
Madison	South Boulder	Mammoth	29-008
Madison	South Boulder	Mammoth Tailings	29-082
Madison	Tidal Wave	B&H	29-083
Madison	Tidal Wave	Dry Gulch South	29-282
Madison	Virginia City	U.S. Grant	29-095
Madison	Virginia City	Belle	29-098
Madison	Virginia City	Kearsage	29-102
Madison	Virginia City	Apex	29-105
Madison	Virginia City	Pacific	29-118
Madison	Virginia City	Easton	29-121
Madison	Virginia City	Prospect	29-136
Madison	Washington	Missouri	29-373
Madison	Washington	SE SE S25	29-394
Madison	Washington	Bigler	30-067
Meagher	Beaver Creek	Cumberland	30-004
Meagher	Castle Mountain	Belle of the Castle	30-007
Meagher	Castle Mountain	SW NE S10	30-078
Meagher	Smith River	Iron Mountain Millsite	31-010
Mineral	Iron Mountain	Belle of the Hills	31-072
Mineral	Iron Mountain	Dillon Millsite	31-073
Mineral	Iron Mountain	Nancy Lee Mine	31-001
Mineral	Keystone	Little Anaconda	31-077
Mineral	Keystone	Nancy Lee Millsite	31-082
Mineral	Keystone	Nancy Lee Millsite - Slowey	31-090
Mineral	Keystone	Tarbox-Mineral King	31-003
Mineral	Packer Creek	Salte Consolidate	31-021
Mineral	Packer Creek	Wallace Creek Millsite	32-019
Missoula	Clinton	Copper Cliff	32-001
Missoula	Copper Cliff	Frogs Diner	32-027
Missoula	Copper Cliff	Linton	32-017
Missoula	Crammer Creek	Morse & Kennedy	32-033

COUNTY	DISTRICT	SITE NAME	P.A. NO.
Missoula	Ninemile	Joe Walitt	32-010
Missoula	Ninemile	Lost Cabin	32-011
Missoula	Ninemile	Nugget	32-042
Missoula	Woodman	Ward Lode	32-005
Park	Emigrant	Allison	34-018
Park	New World	Great Republic Smelter	34-000
Park	New World	McLaren Tailings	34-004
Park	New World	Lower Glengary	34-006
Park	New World	Gold Dust	34-007
Park	New World	Little Daisy	34-009
Park	New World	McLaren Mine	34-010
Park	New World	Black Warrior	34-079
Park	New World	Upper Alice E.	34-085
Park	New World	Fisher Creek No. 1	34-090
Powell	Elliston	Charter Oak	39-003
Powell	Elliston	Lily/Orphan Boy	39-008
Powell	Elliston	Monarch	39-008
Powell	Elliston	Ontario Millsite	39-010
Powell	Elliston	Golden Anchor	39-012
Powell	Elliston	Hard Luck	39-014
Powell	Elliston	Kimball	39-018
Powell	Elliston	Sure Thing	39-020
Powell	Elliston	Julia	39-022
Powell	Elliston	Telegraph	39-023
Powell	Elliston	Third Term	39-024
Powell	Elliston	Anna R./Hattie M.	39-044
Powell	Elliston	Mountain View	39-062
Powell	Emery	Emery	39-004
Ravalli	Curlew	Curlew	41-003
Ravalli	Frog Pond	Montana Prince	41-004
Ravalli	Pleasant View	Blue Bird	41-009
Sanders	Blue Creek	Broken Hill	45-005
Sanders	Plains	Montro Gold	45-010
Sanders	Plains	Lower Letterman	45-047
Sanders	Trout Creek	Holliday (Silver Mark)	45-009
Sanders	White Pine	Jack Waite	45-002
Silver Bow	Basin Creek	Highland Mine	47-028
Silver Bow	Elk Park	Mary Emmes/Clinton	47-035
Silver Bow	Elk Park	Rising Sun	47-037
Silver Bow	Meirose	Old Glory	47-027
Silver Bow	Meirose	Clipper	47-029
Silver Bow	Moose Creek	Middle Fork Millsite	47-081
Stillwater	Stillwater	Benbow Millsite	48-005
Sweet Grass	Independence	Yager/Daisy	49-002



were 22 days of measurable precipitation with a total accumulation of only 3.40 inches of precipitation (measured in Butte, Montana). The reduced amount of precipitation in 1994 may have resulted in a decrease in the observed and, therefore, documented releases to surface water that would have been occurring under 1993 conditions. The 40-year average accumulation for this period is 6.4 inches for the same location.

The physical setting and topography associated with these sites ranged from gently sloping land in valley bottoms to very steep, high elevation, mountainous areas. Site access was often difficult due to poor road conditions or to the absence of maintained roads. Several sites were accessed by foot or by helicopter only. Ownership of the priority sites was a mix of public lands (USFS, BLM, MDSL, etc.) and patented lands (private ownership). The priority sites consisted of primarily inactive/abandoned mine sites; however, exploration activities were in progress at several sites.

Significant features at the sites included tailings ponds, impoundments, and piles; waste rock dumps or piles; mine openings, including adits, shafts, glory holes, and exploration trenches; miscellaneous buildings and structures; and roads. Mine opening discharges and streams adjacent to or flowing through the sites were common.

Hazardous materials observed at some of the sites included chemical reagents, solvents, asbestos-containing material, petroleum fuels or lubricating oils storage (barrels or tanks), and miscellaneous power supply items (poles, transformers, lines, etc.). Some of the sites support wildlife, domestic grazing, or aquatic life. Residential occupation of the sites was observed in rare cases; however, residences adjacent to the sites occurred more frequently.

### 1.3 SUMMARY OF FINDINGS

The following information is provided as an overview of the data compiled during the 1993 and 1994 investigations for the Hazardous Materials Inventory.

#### Laboratory Sampling

- Total number of laboratory samples: 1,963 (does not include the quality assurance/quality control [QA/QC] duplicates), representing approximately 43,200 data points generated by the laboratories.
- Total number of XRF Spectrometer samples: 3,690 (does not include the QA/QC duplicates), representing approximately 77,500 data points.

#### Waste Rock Associated with the Priority Sites

- Estimated total volume: 6,983,000 cubic yards.
- Estimated total area: 16,869,000 square feet (387 acres).
- Estimated total unvegetated/uncovered area: 15,562,000 square feet (357 acres).

#### Mill Tailings Associated with the Priority Sites

- Estimated total volume: 8,550,000 cubic yards.
- Estimated total area: 21,671,000 square feet (498 acres).
- Estimated unvegetated/uncovered area: 14,214,000 square feet (326 acres).

#### Adit Discharges Associated with the Priority Sites

- Total number of discharging adits: 198.
- Number of adit discharges with pH  $\leq$  5.00: 33.
- Number of adit discharges with pH  $\leq$  6.00: 48.

#### Flooded Shafts Associated with the Priority Sites

- Total number of open shafts with water: 13.
- Shafts with pH  $\leq$  5.00: 3.

#### Water Quality Criteria

- Number of discharges exceeding Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs): 93 (87 were adits and 6 were shafts).
- Number of adit discharges exceeding acute aquatic life criteria: 76.
- Number of observed releases to surface water/sediment directly attributable: 148.

## **2.0 INVESTIGATION METHODS**

### **2.1 DATABASE AND LITERATURE SEARCH**

Data collected in the field was supplemented by an extensive literature search and by using several computer databases. This supplemental information was used to complete the inventory forms and to fulfill receptor information requirements for the AIMSS. The computer databases used to collect this information were:

- The Montana Bureau of Mines and Geology (MBMG) Well Logs Database, which was compiled by the MBMG and the DNRC. This database was used to estimate the number of wells within a one-mile and a four-mile radius of each site.
- The Montana Rivers Information System (MRIS), which was compiled by the Montana State Library for the Montana Department of Fish, Wildlife, and Parks (MDFWP). This database was used to classify riparian habitat quality, wetlands frontage, fisheries habitat and species classification, and sport fisheries classification for stream reaches potentially impacted by each site.
- The MDHES/Water Quality Bureau (WQB) - Community Water Supplies Database provided a list of surface water resources presently used for drinking water supplies in Montana.

Additional information was obtained from the following sources:

- Peak and average stream flow estimates were obtained from United States Department of Interior/Geological Survey (USGS) flow monitoring reports on gaged streams.
- Population estimates were obtained by counting buildings delineated on the USGS quadrangle maps and USFS Forest Visitors Maps. Field observations supplemented this information.
- Land ownership was determined from MDSL/AMRB records or USFS Forest Visitor Maps.
- Historic mine/millsite operations, mineralogy, and geology were obtained from several sources, including United States Bureau of Mines (USBM) circulars; USGS bulletins and professional papers; and MBMG memoirs, bulletins, and circulars.

- Historic analytical data were obtained from the MDSL/AMRB project files, the MDHES/SHWB project files, the MDHES/WQB, USFS project files, and MBMG data collected for the USFS. This data was reviewed before site visits to provide the investigators with background information on potential site hazards.

## **2.2 FIELD METHODS**

A detailed discussion of specific investigation methodologies is found in the MDSL/AMRB Hazardous Materials Inventory SAP (AMRB/Pioneer, 1993a and 1994a). This section describes some of the unique details of the investigative methods used to fulfill the project objectives.

The inventory form used during the 1994 investigation was almost identical to the 1993 form except for some with minor improvements that removed redundancies and streamlined decision-making processes. The inventory form is used during the investigation to guide and focus the investigative tasks to ensure consistent evaluation of each site. Literature and database searches were performed before the field investigations to provide investigators with background information on each site.

Sampling was performed on waste rock dumps, mill tailings, streams, ponds, adit discharges, flooded shafts, and on domestic groundwater wells or monitoring wells, when present.

Each tailing's feature was characterized both spatially and vertically by hand-auguring to determine accurate depths and to delineate stratification or differences in metals concentrations between the upper-oxidized zone(s) and the lower reduced zones. Subsamples were collected from each visually different strata.

Typically, several subsamples were collected from each waste rock dump to better characterize very heterogeneous waste sources. Subsamples from the tailings and waste rock were analyzed in the field using an XRF Spectrometer. The field screening data allowed the investigators to make informed decisions on the number of samples required for laboratory analyses and indicated how best to composite the subsamples from the potential sources to send representative samples to the laboratory, while minimizing the number of samples to achieve this end. The XRF Spectrometer analyses also provided an increased number of valid and discrete data points per site achieving a more thorough understanding of the problems associated with each site. Solids were characterized additionally by measuring pH and radioactivity.

Stream sediment samples were also analyzed in the field using the XRF Spectrometer to assist in assessing the extent of contamination and migration from the waste sources.

Surface water sampling was often conducted to characterize impacts to drainage basins, as well as contributions from individual sites when multiple sources were present. Waters were additionally characterized in the field by measuring flow rates, pH, specific conductance, alkalinity, and temperature.

Site mapping was conducted using standard "Chain and Compass" surveying techniques during the 1993 field season and the Global Positioning System during the 1994 field season. Mapping was primarily conducted to estimate the volume and area of waste sources and record sample locations. Other significant site features, such as streams or drainages, roads, mine openings, and structures, were also recorded on the site sketches. Sample locations and other significant site features were documented on photographic slides and video tape to assist the resource managers in evaluating the priority sites.



### 3.0 DATA EVALUATION AND COMPARISONS

This section discusses data quality validation and evaluations, as well as comparisons of the data to pertinent criteria.

#### 3.1 DATA VALIDATION AND EVALUATION

##### 3.1.1 Laboratory Data Validation and Evaluation

The laboratory used during this investigation complied all of the QA/QC performance requirements defined in the EPA Contract Laboratory Program (CLP) Statement of Work (SOW, March 1990). The data packages provided by the laboratory allowed comprehensive data validation and evaluation procedures to be completed. Laboratory data validation and evaluation were performed according to guidelines developed by the EPA.

The laboratory data were validated in accordance with Laboratory Data Validation Functional Guidelines for Evaluating Inorganics (EPA, 1988). The data validation procedures were performed partially by laboratory chemists and partially by a data reviewer from Pioneer Technical Services, Inc. The data validation procedure evaluated:

- holding times;
- initial and continuing calibrations;
- calibration and preparation blanks;
- inductively coupled plasma (ICP) interference check samples;
- laboratory control samples (LCS);
- laboratory duplicate sample analyses (precision assessment);
- matrix spike sample analyses (accuracy assessment);
- furnace atomic absorption (AA) quality control;
- ICP serial dilutions;
- sample result verification;
- field duplicate analyses (precision assessment);
- field blank analyses; and
- overall data for the case.

Data evaluation occurred after the data validation process was completed and the appropriate qualifiers had been applied to the data. The data evaluation process involved a statistical analysis of the data to identify outliers and to assess the overall quality of the data. Data evaluation was performed on the laboratory data which met the Data Quality Objectives (DQOs) outlined in the QAPjP for the Abandoned Mines Hazardous Materials Inventory (AMRB/Pioneer, 1993b and 1994b).

Although numerous qualifications (flags) were applied to the laboratory data compiled during this investigation, and a small portion of the data were evaluated as outliers, none of the data were flagged "R" or were otherwise considered unusable. Consequently, 100 percent of the laboratory data (soil and water) collected during this investigation are considered valid and useable for all objectives of this project.

The data's limitations should be considered when making interpretations. Please refer to Data Validation and Evaluation Report for the Abandoned Mines Hazardous Materials Inventory (AMRB/Pioneer, 1993f and 1994f) for a detailed description of the procedures followed and results provided by the overall data assessments.

### 3.1.2 X-Ray Fluorescence Spectrometer Data Validation

Data provided by the field portable XRF Spectrometer were also validated; the XRF data were validated according to manufacturer specifications. The validation procedures for XRF data were not nearly as rigorous as for laboratory data; consequently, additional procedures, using standard statistical techniques, were employed to evaluate the overall quality of the XRF data. These additional procedures included assessment of XRF duplicate data to quantify precision, as well as comparing XRF data to corresponding laboratory data to assess inter-method precision and correlation.

The comprehensive evaluation of the XRF data determined that inter-method precision was good for all analytes, and the XRF data showed excellent correlation with the laboratory data.

### 3.1.3 Other Field Measurements

Field parameter measurements, such as pH, Eh, and specific conductance, were not evaluated for data quality. SOPs (AMRB/Pioneer, 1993a and 1994a) were carefully followed in the field to achieve a consistent and acceptable level of quality.

## 3.2 DATA INTERPRETATION

The analytical data collected were compared to site-specific background or upgradient concentrations, as well as to drinking water standards and aquatic life criteria. The following sections explain how these comparisons were made.

### 3.2.1 Background Soil Comparison

Background soil samples were collected to establish the extent to which metals concentrations were elevated in comparison to the local background. Background samples were typically applied to groups of sites within close proximity to one another and within similar geologic units.



### 3.2.2 Observed Releases to Groundwater, Surface Water, and Sediment

An observed release to surface water is defined as a downstream surface water or stream sediment concentration at more than three times the upstream surface water or sediment concentration for any constituent that can be attributed to the site. Groundwater, surface water, and stream sediment analytical data were used to document observed releases from the priority sites.

### 3.2.3 MCL/MCLG, and Aquatic Life Criteria Comparisons

MCLs and MCLGs are drinking water standards promulgated under the federal SDWA (40 CFR Parts 141, 143). MCLs and MCLGs apply to public water systems; however, they may be relevant and appropriate to surface or groundwater if those waters are used as drinking water. Groundwater and surface water metals concentrations observed in samples collected were evaluated against these standards. The current SDWA MCLs and MCLGs expressed in micrograms per liter (ug/L) are:

Arsenic: 50 ug/L	Barium: 2,000 ug/L	Cadmium: 5 ug/L
Copper: 1,300 ug/L	Chromium: 100 ug/L	Mercury: 2 ug/L
Nickel: 100 ug/L	Antimony: 6 ug/L	Lead: 15 ug/L
Cyanide: 200 ug/L		

Surface water and mine discharge analytical results were also evaluated against freshwater acute and chronic aquatic life criteria (MDHES/WQB, 1994). Some of these criteria are expressed as a function of total hardness and were corrected for the hardness measured in each sample, when applicable.

## 3.3 DATA MANAGEMENT

The data collected under this project has been input into the data manager, dBase IV - Version 2.0. Four files were created to contain the data and to aid in manipulating the data, if desired. These files are summarized briefly below.

- PTSDATA.DBF contains field data collected for each sample during the Hazardous Materials Inventory.
- XRFDATA.DBF contains the analyses done by the field XRF data generated during the Hazardous Materials Inventory.
- LABDATA.DBF contains the data from all of the laboratory analyses performed during the Hazardous Materials Inventory.
- PRIORITY.DBF is the modified dBase file provided to Pioneer by MDSL/AMRB from the master inventory.

The information from these four files can be readily combined with one another to form a relational database.



## **4.0 SITE RANKING**

The final task of the Hazardous Materials Inventory involved the development of a system to rank the severity of hazards or environmental threats associated with the sites investigated to assist the MDSL/AMRB in prioritizing reclamation efforts and in allocating resources. This system, the Abandoned and Inactive Mines Scoring System (AIMSS), closely follows the EPA's Hazard Ranking System although the AIMSS is specifically focused on potential hazards typically associated with the abandoned or inactive hardrock mines.

The AIMSS also evaluated potential safety hazards associated with the sites such as hazardous mine openings, highwalls, and structures, and generated a separate safety score for each site. The AIMSS used the data collected for each site to assign a ranking score.

The AIMSS is focused towards the physical site setting and potential hazards associated with abandoned and inactive mines due to its capability to evaluate mine opening discharges and large quantities of mine wastes. The AIMSS scoring method evaluates relative risks between sites which accounts for site-specific contaminant concentrations and the varying toxicity of different constituents, as well as adit discharges in the source evaluation. This scoring method more effectively discriminates between sites with higher concentrations or more toxic constituents in relation to sites with lower concentrations or less toxic constituents. To generate an overall Mine Site Human Health and Environmental Hazard Score, the AIMSS evaluates the groundwater pathway, surface water pathway, air pathway, and direct contact pathway. Under each pathway, the AIMSS evaluates observed releases, potential to release, pathway characteristics, waste characteristics, and targets.

Table 4-1 lists the screened priority sites and their associated AIMSS score, sorted in descending order. Three of the 276 sites were not ranked due to complications with inaccessibility; therefore, no data was collected.

The AIMSS also generates a distinct safety score for each site by evaluating site accessibility and safety hazards present (i.e., shafts, stopes, open adits, hazardous structures, and explosives/other hazardous materials or chemicals). Table 4-2 lists the screened priority sites and their associated safety score, sorted in descending order.

The Hazardous Materials Inventory involved the investigation of 331 abandoned or inactive hardrock mine sites. Fifty-five sites were dropped from the Abandoned Hardrock Mine Priority Sites list due to a lack of any significant environmental hazards associated with these sites. Table 4-3 lists the dropped sites. These sites were removed from the priority list because they did not represent a significant risk to human health or the environment for one or more of the following reasons:

- The site did not contain significant concentrations or quantities of heavy metals or other potentially hazardous materials;
- Contaminant migration pathways were not present to potentially impact human health or the environment;
- Active mining was occurring on the sites at the time of the investigation, preventing accurate characterization of the risks as an abandoned or inactive mine site; or
- Sites had been previously reclaimed and risks to human health and the environment had been adequately addressed.

The sites dropped may require additional evaluation at some time in the future due to the potential for changing site conditions or regulatory statutes. These sites may be reinstated on the Abandoned Hardrock Mine Priority Sites List, if warranted.

TABLE 4-1: ABANDONED HARDROCK MINES PRIORITY SITES AIMSS RANKING

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
1	Jefferson	Colorado	Corbin Flats	22-004	4694.70
2	Lewis & Clark	Helena	Joslyn Street Tailings	25-501	1892.74
3	Lewis & Clark	Rimni	Red Mountain (13)	25-019	1628.48
4	Lewis & Clark	Rimni	National Extension	25-287	1305.48
5	Powell	Emery	Emery	39-004	880.35
6	Lewis & Clark	Rimni	Red Water	25-007	878.86
7	Ravalli	Curtew	Curtew	41-003	707.94
8	Lewis & Clark	Marysville	Pegam/Gloster Millsite	25-172	540.51
9	Cascade	Hughesville	Block P Tailings	07-090	536.80
10	Jefferson	High Ore	Comet Tailings	22-009	510.15
11	Powell	Elliston	Charter Oak	39-003	490.37
12	Lewis & Clark	Helena	Spring Hill Tailings	25-087	456.34
13	Philipsburg	Philipsburg	Douglas Creek Tailings	20-003	349.49
14	Judith Basin	Hughesville	Block P Mine	23-001	328.17
15	Jefferson	Colorado	Alta	22-001	262.17
16	Jefferson	Colorado	Washington	22-007	250.19
17	Jefferson	Basin	Enterprise	22-074	245.83
18	Granite	Philipsburg	Scratch All	20-019	240.84
19	Lewis & Clark	Marysville	Empire Millsite	25-175	240.15
20	Broadwater	Indian Creek	Park (Marletta)	04-012	240.02
21	Jefferson	Cataract	Crystal	22-073	239.13
22	Flathead	Hog Heaven	Flathead Mine	15-012	197.97
23	Lewis & Clark	Marysville	Goldsil Millsite	25-385	180.54
24	Mineral	Keystone	Nancy Lee Millsite - Stowey	31-090	175.59
25	Lewis & Clark	Rimni	Peerless Jenny/King	25-008	169.49
26	Broadwater	Winston	East Pacific	04-008	168.83
27	Lewis & Clark	Scratchgravel	Franklin	25-339	160.95
28	Judith Basin	Hughesville	Edwards Lode	23-046	152.86
29	Jefferson	Clancy	Nelle Grant	22-244	135.83
30	Granite	Combination	Combination Millsite	20-009	131.76
31	Cascade	Neihart	Carpenter Creek Tailings	07-103	131.24
32	Lewis & Clark	Rimni	Valley Forge/Suste	25-008	128.10
33	Cascade	Neihart	Silver Dyke Adit	07-135	125.98
34	Broadwater	Winston	Vosburg	04-014	114.32
35	Lewis & Clark	Rimni	Armstrong	25-102	108.59
36	Jefferson	Basin	Bullion	22-008	99.26
37	Silver Bow	Basin Creek	Highland Mine	47-028	98.44
38	Park	New World	Great Republic Smelter	34-000	97.89
39	Lewis & Clark	Rimni	Lower Tennille Millsite	25-030	97.38
40	Madison	Norris/Red Bluff	Boaz	29-013	92.80
41	Granite	Philipsburg	Wenger No. 2	20-073	81.42
42	Lewis & Clark	Rimni	Tennille Mine	25-005	79.57
43	Meagher	Castle Mountain	Cumberland	30-004	76.22
44	Mineral	Keystone	Nancy Lee Millsite	31-082	73.39
45	Cascade	Neihart	Silver Dyke Tailings	07-137	72.88
46	Lewis & Clark	Rimni	Upper Valley Forge	25-280/282	72.21
47	Missoula	Crammer Creek	Linton	32-017	70.47

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
48	Lincoln	Libby	Snowshoe	27-005	69.39
49	Granite	Maxville	Maxville Tailings (Londonberry)	20-209	65.61
50	Lewis & Clark	Marysville	Bald Butte Millsite	25-179	60.47
51	Granite	Philipsburg	Trout	20-082	59.40
52	Lewis & Clark	Rimni	Monte Cristo	25-275	55.69
53	Jefferson	Basin	Buckeye	22-072	55.65
54	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	53.99
55	Granite	Philipsburg	Bi-Metallic/Old Red	20-002	52.19
56	Beaverhead	Ermon	Ermon Mines/Millsite	01-005	49.77
57	Jefferson	Colorado	Gregory	22-005	47.24
58	Madison	Rochester	Thistle Mine/Millsite	29-073	47.02
59	Jefferson	Alhambra	Middle Fork Warm Springs	22-046	46.31
60	Madison	Pony	Garnet Gold Mine	29-035	45.73
61	Silver Bow	Elk Park	Mary Emmee/Clinton	47-035	43.11
62	Cascade	Cascade	Queen of the Hills	07-085	40.68
63	Cascade	Neihart	Neihart Tailings	07-134	40.07
64	Sanders	Plains	Montro Gold	45-010	40.01
65	Madison	Rochester	Emma	29-061	38.99
66	Granite	Philipsburg	Granite Mountain	20-110	38.66
67	Madison	Sheridan	Buckeye	29-451	37.86
68	Madison	South Boulder	Mammoth Tailings	29-082	34.00
69	Jefferson	Colorado	Bluebird	22-003	32.49
70	Granite	Dunkleburg	Forest Rose	20-004	30.90
71	Powell	Elliston	Lily/Orphan Boy	39-006	29.34
72	Judith Basin	Hughesville	Wright Lode	23-045	29.30
73	Cascade	Neihart	Silver Dyke Millsite	07-138	29.19
74	Granite	South Boulder	Brooklyn	20-025	28.72
75	Madison	Sheridan	SE SW S26 (Keynote)	29-474	28.38
76	Judith Basin	Hughesville	Harrison/Moulton	23-056	28.00
77	Jefferson	Basin	Josephine	22-031	28.80
78	Broadwater	Winston	Sunrise/January	04-130	28.59
79	Lewis & Clark	Rimni	Queensbury	25-262	26.24
80	Madison	Washington	Missouri	29-373	24.44
81	Cascade	Neihart	Decolah	07-121	22.34
82	Jefferson	Colorado	Bertha	22-002	21.92
83	Beaverhead	Bannack	Gold Leaf/Priscilla	01-031	21.03
84	Missoula	Woodman	Ward Lode	32-005	19.34
85	Deer Lodge	Silver Lake	Gold Coin	12-004	18.84
86	Granite	South Boulder	Nonpareil	20-012	18.44
87	Gallatin	Bozeman	Karat Asbestos	16-018	17.30
88	Jefferson	Elkhorn	Carmody	22-337	16.48
89	Lewis & Clark	Marysville	Big Ox Millsite	25-115	16.04
90	Powell	Elliston	Ontario Millsite	39-010	15.97
91	Granite	Philipsburg	Algonquin	20-005	15.93
92	Madison	Virginia City	Prospect	29-136	15.91
93	Madison	Silver Star	Broadway/Victoria	28-179	15.84
94	Madison	Virginia City	Pacific	28-116	14.46

TABLE 4-1: ABANDONED HARDROCK MINE PRIORITY SITES AIMSS RANKING (Cont'd)

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
95	Madison	South Boulder	Mammoth	29-008	13.91
96	Lewis & Clark	Stemple	NE NW S13	25-197	13.77
97	Sanders	Blue Creek	Broken Hill	45-005	13.75
98	Lincoln	Libby	Cherry Creek Millsite	27-006	13.22
99	Beaverhead	Lost Creek	Tungsten Millsite	01-170	13.21
100	Beaverhead	Heda	Upper & Lower Cleve	01-143	12.95
101	Broadwater	Winston	Kleinschmidt	04-010	12.77
102	Lewis & Clark	Lincoln	Blackfoot Tailings	25-322	12.48
103	Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157	12.12
104	Cascade	Neihart	Hartley	07-082	11.73
105	Jefferson	Colorado	Argentine	22-102	11.36
106	Madison	Virginia City	U.S. Grant	29-095	10.57
107	Powell	Elliston	Sure Thing	39-020	10.55
108	Jefferson	Cataract	Eva May	22-075	10.19
109	Cascade	Neihart	Broadwater	07-079	10.08
110	Jefferson	Basin	Old Basin Millsite	22-500	9.59
111	Lewis & Clark	Rimint	Woodrow Wilson	25-258	9.58
112	Lewis & Clark	Marysville	Drumhoun Mine/Mill/Tailings	25-024	9.40
113	Beaverhead	Elkhorn-South	Old Elkhorn	01-169	8.80
114	Granite	Philpsburg	True Fisure	20-111	8.83
115	Jefferson	Elkhorn	Queen (Tourmaline)	22-111	7.76
116	Judith Basin	Hughesville	Tiger	23-059	7.72
117	Jefferson	Elkhorn	Elkhorn Queen	22-027	7.51
118	Broadwater	Indian Creek	Bullion King	04-081	7.03
119	Lewis & Clark	Marysville	Bald Mountain	25-061	7.00
120	Cascade	Neihart	Evening Star Mine/Millsite	07-087	6.81
121	Madison	Pony	Boss Tweed	29-034	6.13
122	Mineral	Iron Mountain	Dillon Millsite	31-073	6.10
123	Park	New World	Black Warrior	34-079	6.05
124	Jefferson	High Ore	Grey Eagle	22-029	6.03
125	Jefferson	Cataract	Boulder Chief	22-132	5.93
126	Granite	Antelope Creek	Silver King	20-186	5.50
127	Granite	Philpsburg	Little Gam	20-071	5.44
128	Broadwater	Indian Creek	St. Louis	04-013	5.34
129	Lewis & Clark	Rimint	Beatrice	25-103	5.29
130	Park	New World	McLaren Tailings	34-004	5.26
131	Broadwater	Radersburg	Keating Tailings	04-121	5.21
132	Jefferson	Cataract	Crescent/Alsace	22-106	4.82
133	Park	New World	Lower Glengarry	34-006	4.82
134	Park	New World	McLaren Mine	34-010	4.76
135	Cascade	Neihart	Big Seven	07-166	4.45
136	Mineral	Iron Mountain	Iron Mountain Millsite	31-010	4.13
137	Jefferson	Basin	Basin Millsite	22-036	4.12
138	Madison	Pony	Strawberry	29-038	4.09
139	Madison	Sheridan	Lakeshore	29-436	4.08

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
140	Beaverhead	Heda	True Blue	01-138	4.04
141	Fergus	Warm Springs	G&K Edge Tailings	14-008	4.03
142	Broadwater	Winston	Chartam	04-501	3.94
143	Powell	Elliston	Julia	35-022	3.88
144	Cascade	Neihart	Silver Belt	07-111	3.83
145	Jefferson	Cataract	Rockers/Ada	22-170	3.79
146	Broadwater	Winston	Golden Age	04-050	3.78
147	Beaverhead	Barnack	Apex Millsite	01-008	3.75
148	Lewis & Clark	Stemple	Swansea Tailings/Mine	25-208	3.67
149	Jefferson	Alhambra	Alhambra Hot Springs	22-049	3.59
150	Cascade	Neihart	Melton	07-084	3.32
151	Fergus	Warm Springs	Prestier John	14-090	3.05
152	Cascade	Neihart	Fairplay	07-112	2.76
153	Meagher	Smith River	SW NE S10	30-078	2.70
154	Sanders	White Pine	Jack Waite	45-002	2.69
155	Broadwater	Radersburg	Ohio	04-009	2.64
156	Powell	Elliston	Anna R. Hattie M.	39-044	2.58
157	Judith Basin	Hughesville	Danny T	23-500	2.48
158	Jefferson	Elkhorn	Sourdough	22-336	2.30
159	Madison	Sheridan	Latest Out	29-354	2.18
160	Cascade	Hughesville	Bon Ton	07-094	2.13
161	Jefferson	Basin	Lady Leth	22-316	2.13
162	Mineral	Keystone	Nancy Lee Mine	31-001	2.11
163	Jefferson	Cataract	Morning Glory	22-077	2.10
164	Jefferson	Colorado	Crawley Camp	22-028	2.03
165	Missoula	Elk Creek	Morse & Kennedy	32-033	2.03
166	Lewis & Clark	Stemple	Astor	25-227	2.02
167	Madison	Sheridan	Uncle Sam	29-383	2.02
168	Silver Bow	Elk Park	Rising Sun	47-037	2.02
169	Missoula	Clinton	Wallace Creek Millsite	32-019	1.96
170	Silver Bow	Moose Creek	Middle Fork Millsite	47-081	1.96
171	Jefferson	Alhambra	Solar Silver	22-054	1.90
172	Beaverhead	Birch Creek	Indian Queen	01-034	1.87
173	Madison	Sheridan	NE SE S26	29-476	1.81
174	Cascade	Neihart	Rochester	07-110	1.74
175	Madison	Virginia City	Easton	29-121	1.72
176	Missoula	Ninemile	Lost Cabin	32-011	1.55
177	Broadwater	Winston	Custer Millsite	04-006	1.51
178	Powell	Elliston	Golden Anchor	39-012	1.51
179	Mineral	Iron Mountain	Belle of the Hills	31-072	1.50
180	Judith Basin	Hughesville	Marcoline	23-022	1.48
181	Judith Basin	Hughesville	Belt Patent	23-035	1.47
182	Beaverhead	Heda	Trepper	01-144	1.40
183	Granite	Moose Lake	Banner	20-175	1.39
184	Lewis & Clark	Rimint	Peter	25-259	1.39

TABLE 4-1: ABANDONED HARDROCK MINE PRIORITY SITES AIMSS RANKING (Cont'd)

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
185	Lewis & Clark	Lincoln	Seven-Up Peter/Rover	25-020	1.26
186	Jefferson	Basin	Jack Creek Tailings	22-296	1.22
187	Mineral	Keystone	Little Anaconda	31-077	1.22
188	Powell	Elliston	Mountain View	39-082	1.16
189	Madison	Sheridan	Goldschmidt-Stelner	29-078	1.15
190	Cascade	Neihart	Ripple Mines	07-163	1.14
191	Jefferson	Clancy	General Grant	22-245	1.14
192	Jefferson	Elkhorn	Tecoma	22-284	1.11
193	Cascade	Neihart	Compromise	07-100	1.05
194	Madison	Tidal Wave	B&H	29-083	1.03
195	Judith Basin	Hughesville	Moulton	23-058	1.00
196	Mineral	Packer Creek	Tarbox-Mineral King	31-003	1.00
197	Granite	Frog Pond	Millers Mine	20-176	0.97
198	Park	New World	Fisher Creek No. 1	34-090	0.97
199	Madison	Pony	Atlantic & Pacific	29-033	0.91
200	Lewis & Clark	Marysville	Wildcat	25-317	0.88
201	Missoula	Ninemile	Nugget	32-042	0.88
202	Lewis & Clark	Rimlini	Monitor Creek Tailings	25-503	0.85
203	Cascade	Neihart	Lexington No. 4	07-167	0.83
204	Silverwater	Silverwater	Benbow Milsite	48-005	0.82
205	Jefferson	Basin	Doris	22-293	0.79
206	Granite	Alps	Argo	20-081	0.77
207	Jefferson	Basin	Perry's Park	22-039	0.76
208	Deer Lodge	Silver Lake	Silver Lake Milsite	12-070	0.74
209	Powell	Elliston	Kimball	39-018	0.74
210	Broadwater	Confederate	Miller Mountain	04-138	0.73
211	Powell	Elliston	Monarch	39-008	0.70
212	Cascade	Neihart	Stalabrass	07-120	0.66
213	Park	New World	Little Daisy	34-009	0.66
214	Cascade	Neihart	Emma	07-144	0.63
215	Granite	Philpsburg	Rumsey Mine/Milsite	20-018	0.63
216	Sweet Grass	Independence	Yager/Daisy	49-002	0.61
217	Madison	Sheridan	Broadgauge	29-293	0.60
218	Judith Basin	Hughesville	NE NE ST (Lucky Strike)	23-042	0.56
219	Lewis & Clark	Stemple	SE SW S10	25-212	0.53
220	Jefferson	Elkhorn	Trumley Heep Leach	22-501	0.52
221	Park	New World	Gold Dust	34-007	0.52
222	Missoula	Copper Cliff	Copper Cliff	32-001	0.49
223	Beaverhead	Wisdom	Clara	01-262	0.46
224	Granite	Dunkleburg	Jackson Park	20-027	0.46
225	Madison	Virginia City	Kearsage	29-102	0.45
226	Jefferson	Colorado	Wicks Smeiter	22-358	0.44
227	Madison	Virginia City	Belle	29-098	0.42
228	Missoula	Ninemile	Joe Wallit	32-010	0.42
229	Cascade	Neihart	Maud S.	07-129	0.41
230	Sanders	Trout Creek	Holiday (Silver Mark)	45-009	0.41

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE
231	Mineral	Packer Creek	Saltstie Consolidate	31-021	0.39
232	Beaverhead	Wisdom	Martin	01-270	0.38
233	Missoula	Copper Cliff	Frogs Diner	32-027	0.37
234	Park	Emigrant	Allison	34-018	0.37
235	Granite	Antelope Creek	Art	20-194	0.36
236	Lewis & Clark	Rimlini	Bear Gulch	25-504	0.35
237	Madison	Sheridan	Smuggler	29-010	0.35
238	Powell	Elliston	Hard Luck	39-014	0.32
239	Silver Bow	Melrose	Clipper	47-029	0.32
240	Jefferson	Cataract	Marble (East)	22-032	0.29
241	Fergus	Warm Springs	Cumberland	14-017	0.27
242	Granite	Garnet	Free Coin/Red Cloud	20-134	0.27
243	Madison	Tidal Wave	Dry Gulch South	29-282	0.27
244	Madison	North/Red Bluff	Grubstake	29-399	0.25
245	Lewis & Clark	Stemple	Jay Gould Mine/Milsite	25-500	0.23
246	Broadwater	Helgate	Argo Mine/Milsite	04-015	0.22
247	Deer Lodge	Orofino	Champion	12-003	0.22
248	Lewis & Clark	Marysville	Belmont	25-167	0.22
249	Granite	Dunkleburg	Wassa	20-023	0.20
250	Granite	Alps	Alps	20-065	0.20
251	Fergus	Warm Springs	Tail Hot	14-010	0.16
252	Cascade	Neihart	Sherman No. 2 - SW	07-142	0.15
253	Silver Bow	Melrose	Old Glory	47-027	0.15
254	Lewis & Clark	Marysville	Big Ox Mine	25-116	0.14
255	Ravalli	Pleasant View	Blue Bird	41-009	0.14
256	Jefferson	Elkhorn	Iron	22-359	0.13
257	Madison	Sheridan	Red Pine	29-079	0.13
258	Madison	Washington	SE SE S25	29-394	0.13
259	Powell	Elliston	Telegraph	39-023	0.12
260	Lewis & Clark	Ophir	Victory/Evening Star	25-010	0.11
261	Madison	Virginia City	Apex	29-105	0.11
262	Meagher	Beaver Creek	Bigler	30-067	0.09
263	Park	New World	Upper Alice E.	34-085	0.09
264	Ravalli	Frog Pond	Montana Prince	41-004	0.09
265	Broadwater	Indian Creek	Diamond Hill	04-020	0.08
266	Meagher	Castle Mountain	Belle of the Castle	30-007	0.07
267	Granite	Moose Lake	Old Dominion	20-180	0.06
268	Powell	Elliston	Third Term	39-024	0.06
269	Beaverhead	Hedra	Silver King	01-094	0.05
270	Beaverhead	Lemhi Pass	Last Chance No. 1/IER	01-216	0.05
271	Cascade	Neihart	Vilpa	07-080	0.05
272	Granite	Antelope Creek	Lori No. 13	20-191	0.05
273	Sanders	Plains	Lower Lettman	45-047	0.05
NR	Deer Lodge	Silver Lake	Cable	12-002	0.00
NR	Madison	Rochester	Watseca	29-075	0.00
NR	Madison	Pony	Chicago Mining Corp. Pony Mill	29-500	0.00

TABLE 4-2: ABANDONED HARDROCK MINE PRIORITY SITES SAFETY RANKING

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SCORE
1	Lewis & Clark	Scratchgravel	Franklin	25-339	30330.00
2	Granite	Philipsburg	Trout	20-062	6196.50
3	Granite	Philipsburg	Wenger No. 2	20-073	1152.00
4	Madison	Virginia City	Prospect	29-136	1102.50
5	Jefferson	Colorado	Alta	22-001	1070.80
6	Granite	Philipsburg	Little Gem	20-071	1054.00
7	Broadwater	Indian Creek	Park (Marietta)	04-012	940.80
8	Jefferson	High Ore	Comet Tailings	22-009	918.53
9	Lewis & Clark	Ophir	Victory/Evering Star	25-010	910.00
10	Lewis & Clark	Marysville	Bald Mountain	25-061	848.00
11	Jefferson	Cataract	Morning Glory	22-077	756.40
12	Granite	Philipsburg	Algonquin	20-005	731.00
13	Granite	Philipsburg	True Fissure	20-111	714.00
14	Sweet Grass	Independence	Yager/Daisy	49-002	710.00
15	Meagher	Castle Mountain	Cumberland	30-004	630.00
16	Madison	Silver Star	Broadway/Victoria	29-179	627.50
17	Lewis & Clark	Marysville	Drumblummon Mine/Mill/Tailings	25-024	590.00
18	Madison	Virginia City	U.S. Grant	29-095	586.50
19	Park	New World	Lower Glangary	34-006	560.00
20	Judith Basin	Hughesville	Marcelline	23-022	555.00
21	Cascade	Nehart	Compromise	07-100	522.00
22	Madison	Sheridan	Buckeye	29-451	490.00
23	Broadwater	Radersburg	Ohio	04-009	470.00
24	Lewis & Clark	Rimni	Red Water	25-007	462.00
25	Madison	Pony	Strawberry	29-038	454.00
26	Jefferson	High Ore	Grey Eagle	22-029	440.00
27	Cascade	Nehart	Vilpa	07-080	436.80
28	Jefferson	Elkhorn	Carmody	22-337	435.00
29	Jefferson	Basin	Bullion	22-008	425.00
30	Cascade	Nehart	Queen of the Hills	07-065	405.00
31	Granite	South Boulder	Brooklyn	20-025	405.00
32	Granite	Philipsburg	Douglas Creek Tailings	20-003	404.00
33	Beaverhead	Heda	Upper & Lower Cleve	01-143	390.00
34	Beaverhead	Ermon	Ermon Mines/Millsite	01-005	382.50
35	Granite	Philipsburg	Scratch All	20-019	364.65
36	Granite	Garnet	Free Coin/Red Cloud	20-134	325.50
37	Sanders	Plains	Lower Letterman	45-047	325.00
38	Jefferson	Alhambra	Alhambra Hot Springs	22-049	315.00
39	Granite	Moose Lake	Banner	20-175	310.50
40	Judith Basin	Hughesville	Block P Mine	23-001	308.00
41	Jefferson	Colorado	Corbin Flats	22-004	307.50
42	Deer Lodge	Orofino	Champion	12-003	280.00
43	Park	New World	Gold Dust	34-007	260.00
44	Cascade	Nehart	Rochester	07-110	262.50
45	Broadwater	Helgate	Argo Mine/Millsite	04-015	260.00
46	Cascade	Nehart	Molton	07-064	260.00
47	Jefferson	Basin	Old Basin Millsite	22-500	259.00

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SCORE
48	Beaverhead	Wisdom	Martin	01-270	240.00
49	Beaverhead	Heda	True Blue	01-138	236.00
50	Granite	South Boulder	Nonpareil	20-012	235.00
51	Lewis & Clark	Marysville	Big Ox Millsite	25-115	224.40
52	Granite	Philipsburg	Granite Mountain	20-110	215.00
53	Powell	Elkston	Golden Anchor	39-012	212.80
54	Beaverhead	Birch Creek	Indian Queen	01-034	210.00
55	Madison	South Boulder	Mammoth Tailings	29-082	202.50
56	Powell	Emery	Emery	39-004	200.00
57	Cascade	Nehart	Evening Star Mine/Millsite	07-087	196.00
58	Lewis & Clark	Rimni	Beatrice	25-103	193.80
59	Broadwater	Confederate	Miller Mountain	04-138	190.00
60	Madison	Tidal Wave	Dry Gulch South	29-282	190.00
61	Granite	Dunkleburg	Forest Rose	20-004	186.00
62	Broadwater	Indian Creek	Diamond Hill	04-020	161.25
63	Lewis & Clark	Rimni	Armstrong	25-102	152.50
64	Park	New World	McLaren Mine	34-010	151.50
65	Reval	Curtew	Curtew	41-003	148.50
66	Cascade	Nehart	Decatur	07-121	147.00
67	Granite	Moose Lake	Old Dominion	20-180	144.00
68	Jefferson	Colorado	Argentine	22-102	140.00
69	Madison	Rochester	Thistle Mine/Millsite	29-073	140.00
70	Powell	Elkston	Lily/Orphan Boy	39-006	140.00
71	Lewis & Clark	Marysville	Belmont	25-167	136.50
72	Beaverhead	Elkhorn-South	Old Elkhorn	01-189	130.00
73	Stillwater	Stillwater	Benbow Millsite	48-005	125.00
74	Madison	Rochester	Watseca	29-075	121.80
75	Jefferson	Elkhorn	Iron	22-359	118.50
76	Lewis & Clark	Helena	Spring Hill Tailings	25-067	115.00
77	Fergus	Warm Springs	Cumberland	14-017	113.75
78	Madison	Washington	Missouri	29-373	112.50
79	Madison	Sheridan	Goldschmidt-Steiner	29-078	112.00
80	Broadwater	Winston	Sunrise/January	04-130	108.90
81	Gallatin	Bozeman	Kerst Asbestos	19-018	108.00
82	Jefferson	Clancy	Nellie Grant	22-244	108.00
83	Cascade	Nehart	Broadwater	07-079	104.00
84	Meagher	Beaver Creek	Bigger	30-067	102.00
85	Madison	Sheridan	Smuggler	29-010	101.00
86	Silver Bow	Basin Creek	Highland Mine	47-028	100.00
87	Cascade	Nehart	Silver Belt	07-111	96.00
88	Cascade	Nehart	Emma	07-144	94.60
89	Madison	Virginia City	Belle	29-068	92.80
90	Granite	Philipsburg	Rumsey Mine/Millsite	20-018	91.80
91	Lewis & Clark	Rimni	Red Mountain (13)	25-019	91.00
92	Beaverhead	Bannack	Apex Millsite	01-006	90.90
93	Granite	Maxville	Maxville Tailings (Londonderry)	20-209	88.80
94	Jefferson	Alhambra	Middle Fork Warm Springs	22-046	86.70



TABLE 4-2: ABANDONED HARDROCK MINE PRIORITY SITES SAFETY RANKING (Cont'd)

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SAFETY SCORE
95	Madison	Pony	Garnet Gold Mine	29-035	85.00
96	Silver Bow	Elk Park	Riding Sun	47-037	85.00
97	Lewis & Clark	Marysville	Bald Butte Millsite	25-179	80.00
98	Jefferson	Elkhorn	Tecoma	22-284	77.00
99	Powell	Elliston	Sure Thing	39-020	76.50
100	Lewis & Clark	Stemple	NE NW S13	25-197	75.00
101	Missoula	Ninemile	Joe Walitt	32-010	75.00
102	Cascade	Nehart	Harley	07-082	72.00
103	Cascade	Nehart	Silver Dyke Millsite	07-138	70.40
104	Deer Lodge	Silver Lake	Silver Lake Millsite	12-070	82.00
105	Jefferson	Elkhorn	Elkhorn Queen	22-027	81.00
106	Park	New World	Upper Alice E.	34-085	60.00
107	Jefferson	Catact	Crescent/Alasca	22-106	59.40
108	Lewis & Clark	Marysville	Empire Millsite	25-175	58.80
109	Judith Basin	Hughesville	NE NE S7 (Lucky Strike)	23-042	56.00
110	Jefferson	Colorado	Crawley Camp	22-028	55.20
111	Madison	Sheridan	Broadgauge	29-293	55.00
112	Sanders	Plains	Montro Gold	45-010	55.00
113	Mineral	Keystone	Nancy Lee Millsite - Stowey	31-090	54.60
114	Missoula	Ninemile	Nugget	32-042	53.00
115	Jefferson	Basin	Doris	22-293	51.60
116	Madison	Pony	Boss Tweed	29-034	51.50
117	Granite	Frog Pond	Millers Mine	20-176	50.40
118	Jefferson	Colorado	Washington	22-007	50.40
119	Lewis & Clark	Marysville	Goldsil Millsite	25-365	48.45
120	Ravalli	Pleasant View	Blue Bird	41-009	48.13
121	Beaverhead	Barnack	Gold Leaf/Priscilla	01-031	46.00
122	Cascade	Nehart	Silver Dyke Tailings	07-137	45.00
123	Powell	Elliston	Kimball	39-018	44.80
124	Madison	Pony	Atlantic & Pacific	29-033	41.80
125	Lewis & Clark	Marysville	Plegan/Gloster Millsite	25-172	40.80
126	Jefferson	Elkhorn	Sourdough	22-336	40.50
127	Fergus	Warm Springs	Prestor John	14-090	40.00
128	Madison	South Boulder	Mammoth	29-008	40.00
129	Lewis & Clark	Rimini	Monte Cristo	25-275	38.50
130	Fergus	Warm Springs	Tail Hot	14-010	38.00
131	Powell	Elliston	Hard Luck	39-014	38.00
132	Cascade	Nehart	Silver Dyke Adit	07-135	37.50
133	Beaverhead	Lost Creek	Tungsten Millsite	01-170	35.00
134	Lewis & Clark	Rimini	Tennie Mine	25-005	35.00
135	Missoula	Clinton	Wallace Creek Millsite	32-019	35.00
136	Jefferson	Catact	Eva May	22-075	33.60
137	Broadwater	Winston	East Pacific	04-008	33.55
138	Madison	Sheridan	SE SW S28 (Keynote)	29-474	33.00
139	Jefferson	Colorado	Wickes Smelter	22-358	32.00

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SAFETY SCORE
140	Granite	Antelope Creek	Silver King	20-186	31.20
141	Powell	Elliston	Monarch	39-008	30.25
142	Cascade	Nehart	Maud S.	07-129	30.00
143	Judith Basin	Hughesville	Danny T	23-500	30.00
144	Lincoln	Libby	Snowshoe	27-005	30.00
145	Madison	Virginia City	Kearse	29-102	30.00
146	Park	New World	Fisher Creek No. 1	34-090	30.00
147	Silver Bow	Elk Park	Mary Emmee/Clinton	47-035	30.00
148	Cascade	Nehart	Sherman No. 2 - SW	07-142	28.80
149	Deer Lodge	Silver Lake	Gold Coin	12-004	28.50
150	Meagher	Smith River	SW NE S10	30-078	28.05
151	Lewis & Clark	Rimini	Upper Valley Forge	25-280/282	27.50
152	Missoula	Granmer Creek	Linton	32-017	27.20
153	Broadwater	Indian Creek	Bullion King	04-081	27.00
154	Jefferson	Basin	Lady Leith	22-316	26.00
155	Broadwater	Winston	Kleinschmidt	04-010	23.50
156	Lewis & Clark	Stemple	Swansea Tailings/Mine	25-208	23.10
157	Cascade	Nehart	Ripple Mines	07-163	23.00
158	Lewis & Clark	Rimini	Woodrow Wilson	25-258	22.80
159	Madison	Norris/Red Bluff	Boaz	29-013	21.00
160	Jefferson	Catact	Boulder Chief	22-132	20.25
161	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	20.00
162	Madison	Norris/Red Bluff	Grubstake	29-399	20.00
163	Fergus	Warm Springs	Gilt Edge Tailings	14-008	19.20
164	Judith Basin	Hughesville	Harrison/Moulton	23-058	19.00
165	Cascade	Nehart	Sialabre	07-120	18.00
166	Lewis & Clark	Rimini	Peerless Jenny/King	25-008	17.80
167	Lewis & Clark	Rimini	National Extension	25-287	16.50
168	Powell	Elliston	Telegraph	39-023	15.50
169	Missoula	Copper Cliff	Copper Cliff	32-001	13.80
170	Lewis & Clark	Lincoln	Blackfoot Tailings	25-322	12.00
171	Judith Basin	Hughesville	Edwards Lode	23-046	10.00
172	Powell	Elliston	Mountain View	39-082	10.00
173	Sanders	White Pine	Jack Waite	45-002	10.00
174	Broadwater	Indian Creek	St. Louis	04-013	8.85
175	Lewis & Clark	Lincoln	Seven-Up Pete/Rover	25-020	8.70
176	Broadwater	Winston	Custer Millsite	04-006	8.25
177	Beaverhead	Heda	Trapper	01-144	8.00
178	Silver Bow	Moose Creek	Middle Fork Millsite	47-081	8.00
179	Missoula	Woodman	Ward Lode	32-005	7.50
180	Powell	Elliston	Charter Oak	39-003	7.50
181	Broadwater	Winston	Golden Age	04-050	7.30
182	Granite	Alps	Alps	20-065	7.20
183	Powell	Elliston	Julia	39-022	6.50
184	Missoula	Ninemile	Lost Cabin	32-011	6.40

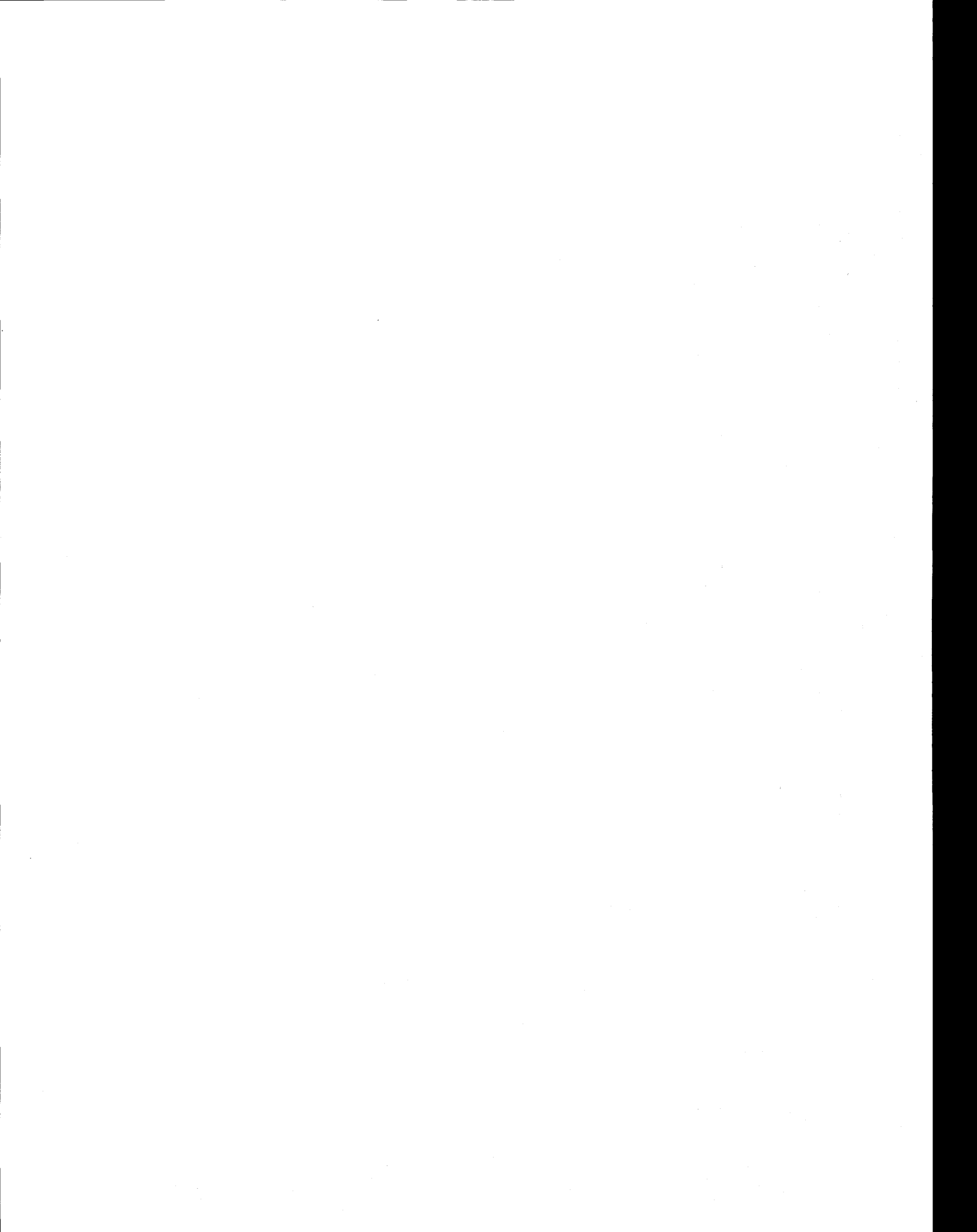
TABLE 4-2: ABANDONED HARDROCK MINE PRIORITY SITES SAFETY RANKING (Cont'd)

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SAFETY SCORE
185	Madison	Virginia City	Apex	29-105	5.00
186	Meagher	Castle Mountain	Belle of the Castle	30-007	5.00
187	Madison	Virginia City	Pacific	29-118	4.50
188	Cascade	Neihart	Ledington No. 4	07-167	4.00
189	Jefferson	Cataract	Rocker/Ada	22-170	3.60
190	Powell	Elliston	Anna R./Hattie M.	39-044	3.60
191	Lewis & Clark	Stemple	Jay Gould Mine/Millsite	25-500	3.10
192	Missoula	Elk Creek	Morse & Kennedy	32-033	3.00
193	Ravalli	Frog Pond	Montana Prince	41-004	3.00
194	Madison	Sheridan	Red Pine	29-079	2.80
195	Broadwater	Winston	Charlam	04-501	2.65
196	Jefferson	Basin	Josephine	22-031	2.55
197	Granite	Dunkleburg	Wasa	20-023	2.50
198	Lewis & Clark	Rimmi	Queensbury	25-262	2.40
199	Granite	Alps	Argo	20-081	1.00
200	Cascade	Hughesville	Bon Ton	07-094	0.80
201	Cascade	Neihart	Rebellion Mine (Upper & Lower)	07-157	0.80
202	Lewis & Clark	Stemple	Astor	25-227	0.80
203	Judith Basin	Hughesville	Tiger	23-059	0.75
204	Lewis & Clark	Rimmi	Monitor Creek Tailings	25-503	0.75
205	Jefferson	Colorado	Bertha	22-002	0.60
206	Jefferson	Alhambra	Solar Silver	22-054	0.50
207	Mineral	Keystone	Nancy Lee Mine	31-001	0.50
208	Judith Basin	Hughesville	Moulton	23-058	0.45
209	Beaverhead	Heda	Silver King	01-094	0.00
210	Beaverhead	Lemhi Pass	Last Chance No. 1/IER	01-216	0.00
211	Beaverhead	Wisdom	Clara	01-262	0.00
212	Broadwater	Winston	Vosburg	04-014	0.00
213	Broadwater	Radersburg	Keating Tailings	04-121	0.00
214	Cascade	Hughesville	Block P Tailings	07-080	0.00
215	Cascade	Neihart	Carpenter Creek Tailings	07-103	0.00
216	Cascade	Neihart	Fairplay	07-112	0.00
217	Cascade	Neihart	Neihart Tailings	07-134	0.00
218	Cascade	Neihart	Big Seven	07-156	0.00
219	Deer Lodge	Silver Lake	Cable	12-002	0.00
220	Flathead	Hog Heaven	Flathead Mine	15-012	0.00
221	Granite	Philpburg	Bl-Metallic/Old Red	20-002	0.00
222	Granite	Combination	Combination Millsite	20-009	0.00
223	Granite	Dunkleburg	Jackson Park	20-027	0.00
224	Granite	Antelope Creek	Lot No. 13	20-191	0.00
225	Granite	Antelope Creek	Ant	20-184	0.00
226	Jefferson	Colorado	Bluebird	22-003	0.00
227	Jefferson	Colorado	Gregory	22-005	0.00
228	Jefferson	Cataract	Mantle (East)	22-032	0.00
229	Jefferson	Basin	Basin Millsite	22-036	0.00
230	Jefferson	Basin	Perry's Park	22-039	0.00

SAFETY RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	SAFETY SCORE
231	Jefferson	Basin	Buckeye	22-072	0.00
232	Jefferson	Cataract	Cryptal	22-073	0.00
233	Jefferson	Basin	Enterprise	22-074	0.00
234	Jefferson	Elkhorn	Queen (Toumaline)	22-111	0.00
235	Jefferson	Clancy	General Grant	22-245	0.00
236	Jefferson	Basin	Jack Creek Tailings	22-296	0.00
237	Jefferson	Elkhorn	Trumley Heap Leach	22-501	0.00
238	Judith Basin	Hughesville	Belt Patent	23-035	0.00
239	Judith Basin	Hughesville	Wright Lode	23-045	0.00
240	Lewis & Clark	Rimmi	Valley Forge/Susie	23-008	0.00
241	Lewis & Clark	Rimmi	Lower Tennille Millsite	25-030	0.00
242	Lewis & Clark	Marysville	Big Ox Mine	25-116	0.00
243	Lewis & Clark	Stemple	SE SW S10	25-212	0.00
244	Lewis & Clark	Rimmi	Peter	25-259	0.00
245	Lewis & Clark	Marysville	Wildcat	25-317	0.00
246	Lewis & Clark	Helena	Joslyn Street Tailings	25-501	0.00
247	Lewis & Clark	Rimmi	Bear Gulch	25-504	0.00
248	Lincoln	Libby	Cherry Creek Millsite	27-006	0.00
249	Madison	Rochester	Emma	29-081	0.00
250	Madison	Total Wave	B&H	29-083	0.00
251	Madison	Virginia City	Easton	29-121	0.00
252	Madison	Sheridan	Latest Out	29-354	0.00
253	Madison	Sheridan	Uncle Sam	29-383	0.00
254	Madison	Washington	SE SE S25	29-394	0.00
255	Madison	Sheridan	Lakeshore	29-436	0.00
256	Madison	Sheridan	NW SE S28	29-476	0.00
257	Madison	Pony	Chicago Mining Corp. Pony Mill	29-500	0.00
258	Mineral	Packer Creek	Tarbox-Mineral King	31-003	0.00
259	Mineral	Iron Mountain	Iron Mountain Millsite	31-010	0.00
260	Mineral	Packer Creek	Salteste Consolidate	31-021	0.00
261	Mineral	Iron Mountain	Belle of the Hills	31-072	0.00
262	Mineral	Iron Mountain	Dillon Millsite	31-073	0.00
263	Mineral	Keystone	Little Anaconda	31-077	0.00
264	Mineral	Keystone	Nancy Lee Millsite	31-082	0.00
265	Missoula	Copper Cliff	Frogs Diner	32-027	0.00
266	Park	New World	Great Republic Smelter	34-000	0.00
267	Park	New World	McLaren Tailings	34-004	0.00
268	Park	New World	Little Daisy	34-009	0.00
269	Park	Emigrant	Allison	34-018	0.00
270	Park	New World	Black Warrior	34-079	0.00
271	Powell	Elliston	Ontario Millsite	39-010	0.00
272	Powell	Elliston	Third Term	39-024	0.00
273	Sanders	Blue Creek	Broken Hill	45-005	0.00
274	Sanders	Trout Creek	Holiday (Silver Mark)	45-009	0.00
275	Silver Bow	Melrose	Old Glory	47-027	0.00
276	Silver Bow	Melrose	Clipper	47-029	0.00

TABLE 4-3: ABANDONED HARDROCK MINE DROPPED PRIORITY SITES

AIMSS RANK	COUNTY	DISTRICT	SITE NAME	P.A. NO.	AIMSS SCORE	SAFETY SCORE
274	Cascade	Neihart	Baker	07-180	0.04	12.00
275	Mineral	Keystone	Keystone	31-074	0.04	51.00
276	Mineral	Keystone	Hopkins	31-078	0.04	30.80
277	Broadwater	Confederate	Hummingbird	04-144	0.03	0.00
278	Gallatin	Bozeman	Elk Creek Corundum	16-013	0.03	15.40
279	Lewis & Clark	Stemple	New Jay Gould Millsite	25-502	0.03	44.00
280	Madison	Virginia City	General Shafter	29-103	0.03	0.00
281	Powell	Elliston	Viking	39-077	0.03	1.25
282	Stillwater	Nye	Mouat	48-001	0.03	30.25
283	Beaverhead	Lemhi Pass	Last Chance No. 2	01-220	0.02	0.00
284	Cascade	Neihart	Snow Creek Millsite	07-505	0.02	1.60
285	Madison	Norwegian	Norwegian	29-006	0.02	4.80
286	Missoula	Woodman	Upper Triantler	32-048	0.02	102.00
287	Beaverhead	Lemhi Pass	South Frying Pan Creek	01-211	0.01	0.00
288	Cascade	Neihart	Hutchinson	07-177	0.01	0.00
289	Jefferson	Basin	Marguerite	22-301	0.01	10.00
290	Lewis & Clark	Stemple	Pangewasset	25-226	0.01	1.25
291	Madison	Tidal Wave	Eleanor Mines (East)	29-285	0.01	0.00
292	Madison	Tidal Wave	Pete & Joe	29-449	0.01	0.00
293	Meagher	Beaver Creek	Lane	30-019	0.01	0.00
294	Mineral	Cedar Creek	Cajun Queen No. 1	31-049	0.01	0.00
295	Missoula	Ninemile	Hautilla	32-057	0.01	20.40
296	Sanders	Plains	Dee Creek	45-041	0.01	50.00
297	Lincoln	Libby	Mitchell Creek	27-055	0.0045	20.00
298	Meagher	Beaver Creek	Porcupine	30-069	0.0040	53.00
299	Cascade	Neihart	Atlantus	07-113	0.0039	60.00
300	Mineral	Iron Mountain	Gold King	31-067	0.0038	0.00
301	Park	New World	Homestake No. 2	34-093	0.0036	410.00
302	Madison	Sheridan	Pedro	29-455	0.0035	0.00
303	Powell	Orphir	NE NW S32	39-052	0.0031	175.00
304	Judith Basin	Yogo	NE NE S31	23-079	0.0030	0.00
305	Lewis & Clark	Helena	Lady Luck	25-073	0.0023	50.00
306	Fergus	Warm Springs	Western Mine/Millsite	14-030	0.0018	36.00
307	Meagher	Beaver Creek	SE NW S24	30-017	0.0018	132.00
308	Madison	Tidal Wave	Ohio	29-473	0.0015	0.00
309	Ravalli	Hughes Creek	Lucky Joe	41-027	0.0010	43.75
310	Mineral	St. Regis	Gold Chrome	31-037	0.0007	0.00
311	Sweet Grass	Independence	Poorman/Emma	49-001	0.0005	36.00
312	Lewis & Clark	Helena	Davis Gulch II	25-040	0.0005	65.00
313	Beaverhead	Lemhi	Thorium City	01-500	0.0003	0.00
314	Beaverhead	Baldy Mountain	Garrett Hill	01-092	0.0002	0.00
315	Madison	Virginia City	JTC	29-106	0.0002	2.50
316	Judith Basin	Yogo	Vortex	23-027	0.0002	0.00
317	Sweet Grass	Independence	NW SE S22	49-003	0.0002	0.00
318	Missoula	Woodman	Mill Creek	32-049	0.00004	2.50
NR	Broadwater	Winston	Aurora Millsite	04-500	0.00	0.00
NR	Cascade	Neihart	Sherman No. 2 (Northeast)	07-140	0.00	6.00
NR	Gallatin	Bozeman	Thumper Mica	16-015	0.00	200.00
NR	Jefferson	Colorado	Minah	22-104	0.00	0.00
NR	Judith Basin	Yogo	Roncor Amax Sapphire	23-501	0.00	0.00
NR	Lewis & Clark	Rimini	SE SE S13	25-294	0.00	0.00
NR	Lewis & Clark	Marysville	Argo Millsite	25-314	0.00	20.40
NR	Lewis & Clark	Helena	Mother Lode	25-363	0.00	0.00
NR	Lincoln	Libby	Silver Cable	27-066	0.00	0.00
NR	Silver Bow	Melrose	Maiden Rock	47-051	0.00	4.20



## **5.0 SITE SUMMARY FORMS**

The following section presents a one-page summary sheet for each of the 276 sites investigated during the inventory. Each summary sheet provides the site name, location and other geographic information, and investigation details and a summary of findings. Analytical data obtained at each site is summarized on the back of each summary sheet. The sites are presented in the order listed in the Table of Contents for this document.

### **SAMPLE DESIGNATION LEGEND**

- GW:** Groundwater sample from well, spring, shaft, or adit discharge.
- SW:** Surface water sample from stream, river, or ditch.
- AD:** Adit discharge.
- SE:** Stream sediment sample.
- TP:** Mill tailings sample from tailings pond or pile or streamside tailings deposit.
- WR:** Waste rock sample from waste rock dump.
- SS:** Background soil sample.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Apex Millsite</u>	County: <u>Beaverhead</u>
Legal Description: T <u>8S</u> R <u>11W</u>	Section(s): <u>SW 1/4, SE 1/4, NW 1/4, Sec. 6</u>
Mining District: <u>Bannack</u>	Mine Type: <u>Millsite/Au, Ag, Cu, Pb</u>
Latitude: <u>N 45° 09' 48"</u>	Primary Drainage: <u>Grasshopper Creek</u>
Longitude: <u>W 112° 59' 50"</u>	USGS Code: <u>10020002</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Grasshopper Creek</u>
Quad: <u>Bannack</u>	Date Investigated: <u>September 16, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>01-006</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The data used to evaluate this site was collected by the MDHES CECRA Program during previous investigations and cleanup efforts.
- The volume of tailings associated with this site was estimated to be approximately 79,800 cubic yards. Previous sampling results have documented elevated levels of arsenic, copper, lead, and zinc in the tailings. A CECRA response action consisting of tailings consolidation and runoff control was conducted by MDHES in 1989. The tailings impoundments were inspected during the MDSL site investigation and were in fair condition. The tailings impoundments were considered to be on the edge of the 100 year flood plain of Grasshopper Creek.
- Monitoring well data did not document any exceedances of MCLs, and no observed releases to groundwater were documented; although, arsenic concentrations were slightly elevated.
- Grasshopper Creek was located approximately 800 feet north (downgradient) of the tailings impoundments. Previous sampling results did not document any observed releases to the Creek attributable to this site.
- One potentially hazardous open adit was identified at the site; although, the adit was gated and locked. The mill building was stabilized as part of the cleanup efforts by MDHES and MDSL/AMRB and is maintained by MDFWP.





**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Gold Leaf/Priscilla</u>	County: <u>Beaverhead</u>
Legal Description: T <u>8S</u> R <u>11W</u>	Section(s): <u>NW 1/4, Sec. 8</u>
Mining District: <u>Bannack</u>	Mine Type: <u>Hardrock/Au. Ag. Pb. Zn. Cu:</u>
Latitude: <u>N 45° 09' 19"</u>	<u>Placer/Au</u>
Longitude: <u>W 112° 59' 05"</u>	Primary Drainage: <u>Grasshopper Creek</u>
Land Status: <u>Private</u>	USGS Code: <u>10020002</u>
Quad: <u>Bannack</u>	Secondary Drainage: <u>Grasshopper Creek</u>
Inspectors: <u>Bullock/Pierson</u>	Date Investigated: <u>September 16, 1993</u>
Organization: <u>Pioneer Technical Services,</u>	P.A. # <u>01-031</u>
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 89,000 cubic yards of tailings in two separate impoundments, the Gold Leaf tailings (70,000) and the Excelsior tailings (19,000). The following elements were at least three times background in the Gold Leaf tailings:

Arsenic: 429J to 593J mg/kg	Cadmium: 4.3J to 4.4J mg/kg
Cobalt: 19.4 to 22.7 mg/kg	Copper: 789 to 902 mg/kg
Iron: 94,000JX to 98,100JX mg/kg	Mercury: 4.09J to 4.59J mg/kg
Lead: 589 to 937 mg/kg	Antimony: 30J to 36.9J mg/kg
Zinc: 587J to 629J mg/kg	

The following elements were at least three times background in the Excelsior tailings:

Cadmium: 2.6J mg/kg	Cobalt: 42.5 mg/kg
Copper: 925 mg/kg	Mercury: 11.4J mg/kg
Lead: 360 mg/kg	Zinc: 345J mg/kg

- There were approximately 267,500 cubic yards of waste rock associated with this site. The following elements were at least three times background:

Cobalt: 12.3 to 16.1 mg/kg	Copper: 392 to 483 mg/kg
Iron: 49,000 to 49,700 mg/kg	Mercury: 0.547J to 0.788J mg/Kg
- There were no adit discharges, seeps or springs associated with this site.
- Grasshopper creek flowed from west to east through this site. Observed releases were documented for copper and zinc. There were no MCLs or MCLGs exceeded. The acute and chronic aquatic life criteria for zinc were exceeded and could be attributed to this site.
- Other potentially hazardous materials on site included two 55-gallon barrels of lube oil, one 55-gallon barrel of hydraulic oil, one 55-gallon barrel of waste oil, and one sealed 55-gallon barrel of unknown content.
- One HMO, the Priscilla Adit, was open and accessible.

Gold Leaf/ Priscilla PA# 01-031  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/16/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-031-SE-1	9.41 J	178 J	1.4 U	5.99	5.81 J	19.9	8660 JX	0.16 J	723	12.2	12	9.47 UJ	56.4 J	NR
01-031-SE-2	18.3 J	108 J	0.9 U	3.89	1.64 J	3.13	5420 JX	0.032 U	400	5.46	6.39 UJ	6.17 UJ	28.5 J	NR
01-031-TP-1	593 J	198 J	4.4 J	22.7	12.7 J	789	94000 JX	4.09 J	937	17.5	589	36.9 J	629 J	2.51
01-031-TP-2	429 J	118 J	4.3 J	19.4	11.1 J	902	98100 JX	4.59 J	573	10.6	988	30 J	587 J	3.54
01-031-TP-3	198 J	217 J	2.6 J	42.5	8.03 J	925	34800 JX	11.4 J	1360	17.3	360	20.1 J	345 J	0.142 U
01-031-WR-1	72.8 J	60.4 J	1.3 J	16.1	4.52 J	392	49000 JX	0.547 J	454	10.6	12.1	4.86 UJ	91.1 J	NR
01-031-WR-2	116 J	55.8 J	1.1 J	12.3	7.97 J	483	49700 JX	0.788 J	536	18.6	38.7	9.41 J	93.8 J	NR
BACKGROUND	76	134	0.5 U	3	10	14.1	12100	0.024 J	482	10	23	7 J	59	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r
01-031-TP-1	0.25	7.81	73.8	66	0.03	<0.01	0	73.8
01-031-TP-2	0.34	10.6	74.3	63.7	0.06	0.02	0.62	73.7
01-031-TP-3	0.26	8.12	137	129	0.02	0.05	1.56	135
01-031-WR-1	3.53	110	176	66.1	2.39	2.46	76.9	99.5
01-031-WR-2	1.48	46.2	115	68.4	0.45	0.36	11.2	103

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
01-031-SW-1	2.62	51	4.59 U	5 U	6.24 U	7.3	228	0.12 U	22.3	74.4	1.14	31.7 U	248	84
01-031-SW-2	1.73	50.5	4.59 U	5 U	6.24 U	2.33 U	215	0.12 U	15.6	10.9 U	1.3	31.7 U	8.71 U	82.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-031-SW-1	141	6	16	< 0.05	NR
01-031-SW-2	182	6	17	0.05	NR

LEGEND

- SE1 - Downgradient of tailing pond 2 on Grasshopper Creek.  
SE2 - Upgradient of waste rock dump 4 on Grasshopper Creek.  
TP1 - Composite of subsamples TP1A, 1B-A, and 1B-B.  
TP2 - Composite of subsamples TP1C-A, 1C-B, and 1C-C.  
TP3 - Composite of subsamples TP2A and 2B.  
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
WR2 - Composite of subsamples WR4A, 4B, 4C, 5A, 5B, and 5C.  
BACKGROUND - From the Erment Mill (01-005-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Indian Queen</u>	County: <u>Beaverhead</u>
Legal Description: T <u>5S</u> R <u>10W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 15</u>
Mining District: <u>Birch Creek</u>	Mine Type: <u>Hardrock/Cu</u>
Latitude: <u>N 45 ° 53' 55"</u>	Primary Drainage: <u>Birch Creek</u>
Longitude: <u>W 112 ° 49' 10"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Birch Creek</u>
Quad: <u>Twin Adams Mountain</u>	Date Investigated: <u>June 15, 1993</u>
Inspectors: <u>Babits, Lasher, Belanger, Clark/ Pierson</u>	P.A. # <u>01-034</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean, and Hoskins, Inc.</u>	

- There were no mill tailings at this site.
- There were approximately 2,600 cubic yards of mostly uncovered slag at the site that extend to the creek. The following were elevated at least three times background:

Cobalt: 57.3 mg/kg	Chromium: 40 mg/kg
Copper: 7,130 mg/kg	Iron: 155,000 mg/kg
Manganese: 14,300 mg/kg	Nickel: 19 mg/kg
Zinc: 873 mg/kg	
- There was approximately 15,490 cubic yards of uncovered waste rock. The following were elevated at least three times background:

Arsenic: 377 to 5,210 mg/kg	Cadmium: 7.4 to 15.6 mg/kg
Cobalt: 20.2 to 74.6 mg/kg	Chromium: 16.4 to 48.2 mg/kg
Copper: 2,070 to 15,900 mg/kg	Iron: 88,400 to 107,000 mg/kg
Mercury: 0.715 to 0.822 mg/kg	Manganese: 1,800 to 2,910 mg/kg
Nickel: 10 to 25 mg/kg	Lead: 468 to 503 mg/kg
Zinc: 431 to 1,490 mg/kg	
- There were no discharging adits identified at the site.
- No surface water samples were collected from Birch Creek due to extremely high water conditions; however, observed releases to Birch Creek sediment were documented for arsenic, cadmium, cobalt, copper, manganese, nickel, lead, and zinc.

Indian Queen PA# 01-034  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-BABITS  
INVESTIGATION DATE: 06/15/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-034-SE-1	5	38.9	< 0.7	2.6	5.7	14	28400	< 0.019	237	< 3	9	< 5	29	NR
01-034-SE-2	448	91.8	7.9	15.4	11.1	4200	51900	< 0.029	1100	9	176	< 6	432	NR
01-034-SG-1	105	42.6	4.6	57.3	40	7130	155000	< 0.013	14300	19	47	< 3	873	NR
01-034-WR-1	759	9.1	7.4	20.2	17.1	15900	107000	0.169	2910	10	503	< 4	431	NR
01-034-WR-2	377	253	15.6	9.7	8.1	826	28000	0.822	1800	12	20	9	646	NR
01-034-WR-3	5210	79.1	11.5	74.6	48.2	13500	92100	0.215	1920	25	468	11	1490	NR
01-034-WR-4	1150	55.1	1.3	12.3	16.4	2070	88400	0.715	2320	7	96	< 3	244	NR
BACKGROUND	43	104	2.2	6.5	5.1	382	19200	0.085	582	3	56	< 4	117	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid Base/Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR /1000g	NEUTRAL POTENT. /1000g	TOTAL SULFUR ACID BASE POTENT. /1000g	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. /1000g	PYRITIC SULFUR ACID BASE POTENT. /1000g
01-034-WR-1	0.47	14.7	15.2	0.49	0.02	<0.01	0.49	0	15.2
01-034-WR1-DUP	0.48	15	15.9	0.95	<0.01	<0.01	0.51	0	15.9
01-034-WR-2	0.02	0.62	41	40.3	0.02	<0.01	<0.01	0	41
01-034-WR-3	0.06	1.87	49.3	47.4	0.05	<0.01	0.01	0	49.3
01-034-WR-4	0.02	0.62	37.2	36.5	0.02	<0.01	<0.01	0	37.2

LEGEND

SE1 - 20' upgradient of slag on Birch Creek.  
SE2 - 20' downgradient of slag on Birch Creek.  
SG1 - slag from East on road on creek.  
WR1 - Sample of subsample WR1B.  
WR2 - Composite of subsamples WR1A, 1B, and 1C.  
WR3 - Composite of subsamples WR3A and 5.  
WR4 - Composite of subsamples WR2, 3B, and 4.  
WR1-DUP - Duplicate of 01-034-WR-1.  
BACKGROUND - From Indian Queen (01-0340SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Old Elkhorn</u>	County: <u>Beaverhead</u>
Legal Description: <u>T 4S R 12W</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 14</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 45° 29' 23"</u>	Primary Drainage: <u>Wise River</u>
Longitude: <u>W 113° 02' 18"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Elkhorn Creek</u>
Quad: <u>Elkhorn Hot Springs</u>	Date Investigated: <u>September 15, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>01-169</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- Ore from this site was milled at the Elkhorn Mill, PA# 01-009.
- The volume of waste rock associated with this site was estimated to be 50,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 121J mg/kg	Mercury: 1.59J mg/kg to 1.75J mg/kg
Cadmium: 4.8J mg/kg	Lead: 717 mg/kg
Copper: 189 mg/kg to 573 mg/kg	Zinc: 821J mg/kg
- There was one open adit identified with a discharge associated with this site with a significant estimated flow of 150 gpm. The pH at this discharge point was 5.72 and the specific conductance was measured at 291 umhos/cm. The MCL for cadmium was exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for iron, cadmium, copper, lead, and zinc were exceeded. A portion of the adit discharge flows over and through waste rock to a settling pond prior to discharging into Elkhorn Creek. There are two seeps associated with this site. The PPE for the adit discharge was sampled as SW-3 just prior to its confluence with Elkhorn Creek. One seep emanates from the northern toe of a waste rock dump characterized by sample SW-2. The MCL/MCLGs were exceeded for cadmium (SW-2, SW-3) and copper (SW-2). The MCL/MCLG for antimony was exceeded for the seep (SW-2). Acute aquatic life criteria was exceeded for copper and zinc in SW-2 and SW-3. Chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc in SW-2 and SW-3.
- Two surface water samples were collected on Elkhorn Creek; SW-1 was downstream and SW-4 was upstream of the site. Observed releases to Elkhorn Creek were documented for copper and zinc. No MCLs were exceeded; however, acute and chronic aquatic life criteria were exceeded for copper and zinc which were directly attributable to the site.
- There were two potentially hazardous structures associated with this property. In addition, WR-1 was rated overly steep and was eroding. The open adit was classified as a hazardous mine opening, especially due to the heavy tourist use.

Old Elkhorn PA# 01-169  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/16/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-169-SE-1	7.09 J	35.4 J	0.9 U	2.37	1.22 U	52.9	6980 JX	0.032 U	392	4.58	6.68	6.18 UJ	134 J	NR
01-169-SE-2	4.02 U	18.2 J	0.8 U	1.09	1.05 U	1.83	2820 JX	0.031 U	251	4	5.51 UJ	5.32 UJ	19 J	NR
01-169-WR-1	17.1 J	121 J	0.9 U	4.59	1.18 U	189	14500 JX	1.59 J	393	5.16	22.2	5.99 UJ	123 J	NR
01-169-WR-2	121 J	55.1 J	4.8 J	4.19	1.25 U	573	18200 JX	1.75 J	1590	4.13	717	9.92 J	821 J	NR
BACKGROUND	12.3 J	182 J	1.1 U	6.54	4.37 J	17.8	12300 JX	0.052 J	1170	8.28	15.8	7.35 UJ	158 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE	NEUTRAL POTENT. 1/1000	POTENT. 1/1000	ACID BASE	POTENT. 1/1000	SULFUR %	ACID BASE	SULFUR %	ACID BASE	SULFUR %	ACID BASE	POTENT. 1/1000	POTENT. 1/1000
01-169-WR-1	0.26	8.12	33.1	25	<0.01	0.09	0.17	2.81	0.58	3.44	30.3	4.18		
01-169-WR-2	1.07	33.4	7.61	-26	0.38	0.11								

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
01-169-GW-1	19.9	5.03	17.8	6.47	6.24 U	745	3590	0.12 U	3590	10.9 U	107	31.7 U	3630	99.3
01-169-SW-1	1.12 U	11.7	4.59 U	5 U	6.24 U	23.6	32.2	0.12 U	71.1	10.9 U	1.88	31.7 U	159	22.8
01-169-SW-2	1.18	8.2	49.2	10	6.24 U	2930	926	0.12 U	9490	14.7	57.5	50.8	11100	225
01-169-SW-3	1.26	11.8	16.5	6.33	6.24 U	700	193	0.12 U	3210	10.9 U	25	31.7 U	3500	102
01-169-SW-4	1.12 U	10.1	4.59 U	5 U	6.24 U	2.33 U	30.1	0.12 U	7.47	10.9 U	0.94 U	35.3	8.71 U	17.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-169-GW-1	238	< 5	124	0.09	NR
01-169-SW-1	67	< 5	12	0.07	NR
01-169-SW-2	542	< 5	297	0.05	NR
01-169-SW-3	204	< 5	131	< 0.05	NR
01-169-SW-4	42	< 5	5	0.05	NR

LEGEND

SE1 - Downgradient Elkhorn Creek near old bridge.

SE2 - Upgradient Elkhorn Creek.

WR1 - Composite of subsamples WR1A and 1B.

WR2 - Composite of subsamples WR1C through 1G.

BACKGROUND - From the Old Elkhorn Mine (01-169-SS-1).

GW1 - Adit #1 discharge.

SW1 - Same as sample SE1.

SW2 - Seepage from North end of waste rock dump 1 at PPE to Elkhorn Creek.

SW3 - Adit discharge at PPE to Elkhorn Creek.

SW4 - Upgradient Elkhorn Creek.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Ermont Mill</u>	County: <u>Beaverhead</u>
Legal Description: T <u>6S</u> R <u>11W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 35</u>
Mining District: <u>Ermont</u>	Mine Type: <u>Hardrock/Ag. Au, Cu</u>
Latitude: <u>N 45° 16' 05"</u>	Primary Drainage: <u>Beaverhead River</u>
Longitude: <u>W 112° 54' 50"</u>	USGS Code: <u>10020002</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Ermont Gulch</u>
Quad: <u>Ermont</u>	Date Investigated: <u>June 14, 1993</u>
Inspectors: <u>Babits, Belanger, Lasher,</u>	P.A. # <u>01-005</u>
<u>Clark/Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 200,000 cubic yards of uncovered tailings on site. The following were elevated at least three times background:

Arsenic: 3,510 mg/kg	Mercury: 1.38J mg/kg
Barium: 796 mg/kg	Antimony: 54J mg/kg
Cobalt: 11.5 mg/kg	Zinc: 334 mg/kg
Iron: 36,500 mg/kg	
  
- There were approximately 4,160 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 431 mg/kg
Cobalt: 9.3 mg/kg
Mercury: 1.06J mg/kg
  
- There were no discharging adits on site.
  
- A dry intermittent drainage was identified on site; however, no surface water or sediment samples were collected because the nearest flowing water was one and one-half miles from the site.

Ermont Mill and Mines PA# 01-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-005-TP-1	3510	796	1.3	11.5	11.8	22.4	36500	1.38 J	852	14	61	54 J	334	13.5
01-112-WR-1	431	192	0.4 U	9.3	5.1	17.6	20300	1.06 J	629	6	16	10 J	43	NR
BACKGROUND	76	134	0.5 U	3	10	14.1	12100	0.024 J	482	10	23	7 J	59	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE	POTENT.	1/1000	NEUTRAL.	POTENT.	1/1000	ACID BASE	POTENT.	1/1000	SULFUR	ACID BASE	SULFUR	ACID BASE	SULFUR	ACID BASE	SULFUR	ACID BASE
01-005-TP-1	0.14	4.37	84.2	79.8	0.13	0.02	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01
01-112-WR-1	<0.01	0	398	398	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.01	0.01	0.01	0.01

LEGEND

TP1 - Composite of subsamples TP1A-A, -B, -C, and 1B-A, -B, -C, -D, -E.  
WR1 - Composite of subsamples WR1, 2A, 2B, 3, and 5.  
BACKGROUND - Across drainage from edit #4.  
From the Ermont Mill (01-005-SR-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Silver King</u>	County: <u>Beaverhead</u>
Legal Description: T <u>3S</u> R <u>11W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 11</u>
Mining District: <u>Hecla</u>	Mine Type: <u>Hardrock/Pb, Zn, Ag</u>
Latitude: <u>N 45° 35' 08"</u>	Primary Drainage: <u>Big Hole River</u>
Longitude: <u>W 112° 55' 42"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Trapper Creek</u>
Quad: <u>Hardrock/Pb, Zn, Ag</u>	Date Investigated: <u>August 26, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>01-094</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings found to be associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 1,100 cubic yards. The following elements were elevated at least three times background:
  - Cadmium: 918J mg/kg
  - Mercury: 26.6J mg/kg
  - Lead: 32,300JX mg/kg
  - Antimony: 339J mg/kg
  - Zinc: 113,000J mg/kg
- There were two collapsed adits observed at this site. Groundwater was not likely to be present; and limestone was present to buffer water that may pass through the old workings. There were no adit discharges, seeps or springs associated with this site.
- There were no direct pathways observed from this site to Trapper Creek, located approximately ¼ mile below the site. No surface water or groundwater samples were collected.
- No other hazardous materials were observed at this site.

Silver King PA# 01-094  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-094-WR-1	91.9	23 J	918.00 J	2.68	4.57 JX	266	25800	28.6 J	544 J	7.99 JX	32300 JX	339 J	113000 J	NR
BACKGROUND	43	104	2.2	6.5	5.1	382	19200	0.085 J	582	3	56	4 UJ	117	<0.271

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000t	SULFUR ACID BASE POTENT. v/1000t
01-094-WR-1	0.67	20.9	401	380	<0.01	0.68	0.3	20.6	381
01-094-WR-1DUP	0.67	20.9	408	385	<0.01	0.7	0.28	21.9	384

LEGEND

SE2 -

WR1 - Composite of subsamples WR1A, 1B, and 2.

BACKGROUND - From the Indian Queen Mine (01-034-SS-1).

WR1DUP - Duplicates of the 01-094-WR-1 sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>True Blue</u>	County: <u>Beaverhead</u>
Legal Description: <u>T 3S R 11W</u>	Section(s): <u>SW 1/4, NE 1/4, Section 2</u>
Mining District: <u>Hecla/Vipond Park</u>	Mine Type: <u>Millsite/Ag. Pb. Au</u>
Latitude: <u>N 45° 36' 18"</u>	Primary Drainage: <u>Trapper Creek</u>
Longitude: <u>W 112° 55' 42"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Spring Creek</u>
Quad: <u>Mount Tahepia</u>	Date Investigated: <u>August 1, 1994</u>
Inspectors: <u>Bisch, Flammang, West</u>	P.A. # <u>01-138</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 5,860 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 81.4 to 85.7 mg/kg	Arsenic: 142J to 3,030J mg/kg
Cadmium: 37.9J to 293J mg/kg	Copper: 767 to 8,970 mg/kg
Mercury: 2.96JX to 90.4JX mg/kg	Lead: 7,780 to 38,400 mg/kg
Antimony: 114J to 1,420J mg/kg	Zinc: 12,800 to 34,000 mg/kg
- The volume of waste rock observed at the site was estimated to be 1,350 cubic yards. The waste rock was sampled for XRF analysis only due to the coarse nature of the material in conjunction with well established vegetation on the dumps. The following elements were elevated at least three times background:

Copper: 337 mg/kg	Iron: 66,247 mg/kg
Manganese: 3,794 mg/kg	
- An unnamed tributary to Sappington Creek flows adjacent to the site on the north side; observed releases to the tributary (sediment) were documented for silver, arsenic, and cadmium.
- No MCLs were exceeded in the tributary; however, the chronic aquatic life criteria for mercury was exceeded in both the upstream and downstream samples, and the chronic aquatic life criteria for lead was exceeded in the upstream sample.
- A spring emanating from near the foot of the mill was sampled during the investigation. The EPA action level for lead and the acute and chronic aquatic life criteria for copper, lead, and zinc were all exceeded in the spring sample.
- Potential safety hazards observed at the site included the collapsing mill building (which is a very large structure) and several collapsing cabins.

True Blue PA# 01-138  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 08/01/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-138-SE1	4.2	54.1 J	21.8	3.8 J	3.8	5.1 J	125	19200 JX	0.60 JX	268 J	9.3	548	22.1 J	537	NR
01-138-SE2	1.2	17.7 J	44.4	1.1 UJ	8.5	8.0 J	47.6	23700 JX	0.43 JX	342 J	13.1	243	14.3 UJ	232	NR
01-138-TP1	81.4	142 J	6.9	37.9 J	2.5	1.3 UJ	767	3620 JX	2.96 JX	724 J	3.2	7780	114 J	12800	NR
01-138-TP2	85.7	3030 J	37.0	293 J	4.6	14.8 J	8970	32800 JX	90.4 JX	2520 J	14.7	38400	1420 J	34000	NR
BACKGROUND	2.1	45.0 J	223 J	2.2 J	10.1	16.2 J	45.7	19600 JX	0.34 JX	1190 J	14.2	275	13.0 UJ	322	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE POTENT		SULFUR ACID BASE POTENT	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
01-138-TP1	<0.01	0.08	0.00	200	<0.01	200	<0.01	0.03	<0.01	<0.01	0.03	0.00	<0.01	0.00	200	200
01-138-TP2			2.50	172	0.07	169	0.02	0.02	<0.01	<0.01	0.02	0.00	<0.01	0.00	172	172

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Pb	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
01-138-SW1	0.12	1.9	23.6	4.0 U	8.4 U	6.8 U	5.9 U	37.4	0.13	2.3 U	14.4 U	4.5 J	51.6 U	15.6 U	158
01-138-SW2	0.12 U	2.1	23.3	4.0 U	8.4 U	6.8 U	5.9 U	98.9	0.12	6.4	14.4 U	6.3 J	51.6 U	15.6 U	162
01-138-SW3	1.02	11.8	10.5	4.0 U	8.4 U	9.0	35.2	222	0.25	24.0	14.4 U	252 J	51.6 U	247	109

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-138-SW1	103	<5.0	5.0	0.14	NR
01-138-SW2	134	<5.0	5.0	0.17	NR
01-138-SW3	56	<5.0	<5.0	<0.05	NR

LEGEND

- SE1 - Downgradient of TP1; pit is 340' west and 100' north.  
SE2 - Upgradient of all pits just below where three seeps emerge.  
TP1 - Grab sample of the TP1A sub-sample.  
TP2 - Grab sample of the TP1C sub-sample.  
BACKGROUND - From the True Blue Mine (01-138-001).  
SW1 - Same as sample 01-138-SE1.  
SW2 - Same as sample 01-138-SE2.  
SW3 - Spring approx. 10' southeast of southeast mill building east.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lower and Upper Cleve</u>	County: <u>Beaverhead</u>
Legal Description: <u>T 3S R 11W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 1</u>
Mining District: <u>Hecla</u>	Mine Type: <u>Hardrock/Ag. Cu, Pb</u>
Latitude: <u>N 45° 36' 14"</u>	Primary Drainage: <u>Trapper Creek/Big Hole</u>
Longitude: <u>W 112° 54' 45"</u>	<u>River</u>
Land Status: <u>Private</u>	USGS Code: <u>10020004</u>
Quad: <u>Mount Tahepia</u>	Secondary Drainage: <u>Sappington Creek</u>
Inspectors: <u>Bullock/Pierson</u>	Date Investigated: <u>September 14, 1993</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	P.A. # <u>01-143</u>

- There were no mill tailings found to be associated with this site.
- The volume of waste rock associated with this site was estimated to be 49,000 cubic yards. (Upper Cleve adits and dumps were added due to the close proximity and contribution to erosion problems.) The following elements were elevated at least three times background:

Arsenic: 268J to 615J mg/kg	Nickel: 12.8 mg/kg
Cadmium: 18.9 to 51.0 mg/kg	Lead: 1,920 to 9,770 mg/kg
Copper: 1,540 mg/kg	Antimony: 225J to 352J mg/kg
Mercury: 8.97J to 16.6J mg/kg	Zinc: 3,310 to 7,670 mg/kg
Manganese: 6,600 mg/kg	
- There were no adit discharges, seeps or springs identified at this site.
- The mine was located near the headwaters of the North Fork of Sappington Creek. Surface water samples were collected upstream and downstream from the site; no MCLs/MCLGs or acute or chronic aquatic life criteria were exceeded. The pH ranged between 8.63 and 8.80 and Eh ranged between 218 to 240 mV.
- Observed releases to the North Fork of Sappington Creek (sediment) were documented for arsenic, lead, and antimony.
- Two open adits located at this site were classified as hazardous mine openings.

Upper and Lower Cleve PA# 01-143  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/14/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-143-SE-1	319 J	31.1	8.92	7.61	9.51	416	24800	3.51 J	542	19.5	1690	327 J	1310	NR
01-143-SE-2	162 J	22.8	14.70	4.89	11.9	522	12800	6.28 J	670	12.1	3930	135 J	2730	NR
01-143-SE-3	81.5 J	46.6	5.43	4.41	11.3	214	12500	1.88 J	704	14.7	1270	51.5 J	1230	NR
01-143-WR-1	615 J	22.7	51.00	3.11	5.68	1540	12700	16.6 J	6600	12.8	9770	352 J	7670	NR
01-143-WR-2	268 J	0.19 U	18.90	1.09	2.14	440	11500	8.97 J	878	4.36	1920	225 J	3310	NR
BACKGROUND	43	104	2.2	6.5	5.1	382	19200	0.085 J	582	3	56	4 UJ	117	< 0.271

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
01-143-WR-1	<0.01	0	482	482	<0.01	482	<0.01	<0.01	<0.01	0	0.01	0	0	0	482	482
01-143-WR-2	<0.01	0	497	497	<0.01	497	<0.01	<0.01	<0.01	0	0.01	0	0	0	497	497

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CAL.C. (mg CaCO3/L)
01-143-SW-1	3.09	13.1	4.59 U	5 U	6.24 U	2.33 U	13.7 U	0.23 J	3.76 U	10.9 U	2.58	31.7 U	15.6	159
01-143-SW-2	2.81	11.5	4.59 U	5 U	6.24 U	2.33 U	15.5	0.13 J	3.76 U	10.9 U	1.33	31.7 U	8.71 U	154

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-143-SW-1	193	< 5	< 5	0.1	NR
01-143-SW-2	199	< 5	5	0.1	NR

LEGEND

SE1 - Downgradient sediment, 650' below road to Trapper Mine in Seppington Creek.  
SE2 - 150' below waste rock dump 1 on Seppington Creek.  
SE3 - 110' above waste rock dump 1 on Seppington Creek.  
WR1 - Composite of subsamples WR1A and 1C.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From the Indian Queen Mine (01-034-SS-1).  
SW1 - 150' below waste rock dump 1 on Seppington Creek.  
SW2 - 110' above waste rock dump 1 on Seppington Creek.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Trapper</u>	County: <u>Beaverhead</u>
Legal Description: T <u>3S</u> R <u>11W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 12</u>
Mining District: <u>Hecla</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Cu</u>
Latitude: <u>N 45° 35' 45"</u>	Primary Drainage: <u>Trapper Creek</u>
Longitude: <u>W 112° 54' 52"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>N. Fk. Sappington Ck.</u>
Quad: <u>Mount Tahepia</u>	Date Investigated: <u>August 26, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>01-144</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of mill tailings associated with this site was estimated to be 1,460 cubic yards. The following elements were elevated at least three times background:

Arsenic: 818J to 1,260J mg/kg	Manganese: 1770 mg/kg
Cadmium: 65.9J to 110J mg/kg	Nickel: 16.3 to 34.3 mg/kg
Chromium: 16.8 mg/kg	Lead: 7860 to 13,600 mg/kg
Copper: 2570 to 3980 mg/kg	Antimony: 463 to 536 mg/kg
Mercury: 39.6J to 85.8J mg/kg	Zinc: 21,800 to 24,200 mg/kg
- The volume of waste rock associated with this site was estimated to be 6,700 cubic yards. The following elements were elevated at least three times background:

Arsenic: 505J mg/kg	Nickel: 10.6 mg/kg
Cadmium: 96.2J mg/kg	Antimony: 157 mg/kg
Mercury: 10.6J mg/kg	Zinc: 1060 mg/kg
- There were no adit discharges, seeps or springs observed at this site.
- The Main Fork of Sappington Creek appeared to flow through and around the tailings pond during high flow events. Surface water samples were collected up and down stream of this site and there were no documented releases or MCL/MCLGs exceedences. No acute or chronic aquatic life criteria were exceeded. Sediment samples were collected up and down stream from this site. Observed releases of copper, lead, mercury, nickel, and zinc were documented in the sediments.
- There were two hazardous structures identified at this site, the old mill and a cabin.

Trapper PA# 01-144  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/15/93

# SOLID MATRIX ANALYSES

## Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-144-SE-1	11.1	13.4 J	0.987 UJ	3.48	8.27 JX	22.1	7640	0.181 J	302 J	9.57 JX	374 JX	10.9 J	206 J	NR
01-144-SE-2	5.62	12.4 J	0.953 UJ	2.37	3.14 JX	0.484 U	3920	0.038 UJ	251 J	2.55 JX	6.81 UJX	6.58 UJ	22.7 J	NR
01-144-TP-1	818 J	4.92	65.9 J	2.78	6.58	2570	10200	39.6 J	811	16.3	7860	463	21800	NR
01-144-TP-2	1260 J	32.5	110 J	6.71	16.8	3980	18500	85.8 J	1770	34.3	13600	536	24200	NR
01-144-WR-1	505 J	0.187 U	96.2 J	2.46	1.48	0.396 U	7240	34.3 J	1180	10.6	5.58 U	157	1060	NR
BACKGROUND	43	104	2.2	6.5	5.1	382	19200	0.085 J	582	3	56	4 UJ	117	<0.271

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

## Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
01-144-TP-1	0	1	188	187	0	187	<0.01	0	<0.01	0	<0.01	0	188	188
01-144-TP-2	0	1	136	135	<0.01	135	0	0	0	1	0	0	135	135
01-144-WR-1	0	2	888	886	0	886	0	0	<0.01	0	0	0	888	888

# WATER MATRIX ANALYSES

## Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC
01-144-SW-1	1.12 U	32.8	4.59 U	5 U	6.24 U	2.33 U	31.1 J	0.22	3.76 U	10.9 U	1.02	31.7 U	11.4	152
01-144-SW-2	1.12 U	31.1	4.59 U	5 U	6.24 U	2.33 U	36.3 J	0.2	5.8	10.9 U	0.94 U	31.7 U	8.71 U	168

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

## Wet Chemistry

### Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-144-SW-1	179	< 5.0	6	< 0.05	NR
01-144-SW-2	169	< 5.0	5	< 0.05	NR

## LEGEND

- SE1 - Seppington Creek 200 feet below last tailings pond.  
SE2 - Seppington Creek 100 feet upstream from waste rock.  
TP1 - Composite of subsamples TP1B, 2AA, and 3AA.  
TP2 - Composite of subsamples TP2AB and 3AB.  
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
BACKGROUND - From Indian Queen Mine (01-034-SB-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Last Chance No. 1/IER</u>	County: <u>Beaverhead</u>
Legal Description: T <u>10S</u> R <u>15W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 29</u>
Mining District: <u>Lemhi Pass</u>	Mine Type: <u>Hardrock/Thorium, Uranium</u>
Latitude: <u>N 44° 56' 25"</u>	Primary Drainage: <u>North Frying Pan Creek</u>
Longitude: <u>W 113° 28' 12"</u>	USGS Code: <u>10020001</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>North Frying Pan Creek</u>
Quad: <u>Lemhi Pass</u>	Date Investigated: <u>August 25, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>01-216</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- This site was an uranium mine associated with the Last Chance No. 2 (PA# 01-220) and the South Frying Pan Creek (PA# 01-211) mines.
- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 13,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 37.4 mg/kg	Mercury: 4.53J mg/kg
Barium: 4,370J mg/kg	Manganese: 4,760 mg/kg
Cobalt: 18.8 mg/kg	Lead: 31.1 mg/kg
Copper: 70.6 mg/kg	Zinc: 149 mg/kg
Thorium-228: 440 pCi/l	Thorium-230: 150 pCi/l
Thorium -232: 420 pCi/l	Uranium-234: 6.8 pCi/l
Uranium-238: 7.2 pCi/l	
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- The nearest surface water drainage was a small intermittent stream bed (dry during the investigation) located approximately 250 feet from toe of dump. No direct runoff pathways from the waste rock dump to the drainage were identified.
- High radiation readings were observed in the open trench (7.0 mR/HR) located above the adit and in the waste rock material (0.90 to 4.0 mR/HR).
- Potential safety hazards associated with the site included a adit with a locked gate, a highwall associated with the trench cut, and a steep and unstable waste rock dump.

Last Chance #1/IER PA# 01-216  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-216-WR-1	37.4	4370 J	0.8 U	18.8	2.63	70.6	9120	4.53 J	4760	13 J	31.1	11.8 J	149	NR
BACKGROUND	5.13 U	221 J	1.0 U	3.82	4.61	6.23	7120	0.033 U	944	9.52 J	7.03 U	6.79 UJ	33.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested; \* - From Barringer Laboratory

Radiochemistry

FIELD ID	Analyte Th-228 (pCi/l)	Analyte Th-230 (pCi/l)	Analyte Th-232 (pCi/l)	Analyte U-234 (pCi/l)	Analyte U-235 (pCi/l)	Analyte U-238 (pCi/l)
01-216-WR-1*	440 [20]	150 [10]	420 [20]	6.8 [1.1]	0.1 [0.3]	7.2 [1.2]
BACKGROUND*	1.6 [0.7]	1.4 [0.05]	1.7 [0.7]	0.9 [0.5]	0.0 [0.2]	0.8 [0.5]

[ ] - Plus or minus

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL	NEUTRAL POTENTIAL	SULFUR POTENTIAL	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR POTENTIAL	SULFUR ACID BASE POTENTIAL
01-216-WR-1	0.49	15.3	20.1	4.8	0.03	0.04	0.42	1.25	18.9

LEGEND

WR1 - Composite of subsamples WR1A and 1B.  
BACKGROUND - From the Last Chance #1/IER (01-216-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Tungsten Millsite</u>	County: <u>Beaverhead</u>
Legal Description: <u>T 4S R 9W</u>	Section(s): <u>SW 1/4, Sec. 4; SE 1/4, SE 1/4, Sec. 5</u>
Mining District: <u>Lost Creek</u>	Mine Type: <u>Millsite/Tungsten</u>
Latitude: <u>N 45° 30' 45"</u>	Primary Drainage: <u>Big Hole River</u>
Longitude: <u>W 112° 43' 45"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Sassman Gulch</u>
Quad: <u>Earls Gulch</u>	Date Investigated: <u>September 13, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>01-170</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 448,000 cubic yards. A heavy petroleum odor was observed in the lower clay of TP-4 (Total Petroleum Hydrocarbons = 611 mg/kg). The following elements were elevated at least three times background:

Barium: 2620 mg/kg	Manganese: 4,380 to 14,900 mg/kg
Cadmium: 2.81 mg/kg	Lead: 123 mg/kg
Copper: 107 to 567 mg/kg	Antimony: 19.9 mg/kg
Mercury: 0.054 to 0.475 mg/kg	Zinc: 468 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 11,700 cubic yards. The following elements were elevated at least three times background:

Copper: 2380 mg/kg	Antimony: 18.5 mg/kg
Mercury: 0.054 mg/kg	Manganese: 2310 mg/kg
- The site was partially reclaimed in 1990.
- Several residences were located in close proximity to the site. Groundwater sample were collected from residential well located directly downgradient from the site and one directly upgradient from the site. Total petroleum hydrocarbons were measured at 23.3 mg/L in the downgradient well (GW-1). No MCLs were exceeded in either of the wells; however, the chronic aquatic life criteria for mercury was exceeded in the upgradient well (GW-2). Additionally, an observed release to groundwater was documented for barium, which was directly attributable to the site.
- No surface water was observed on or near the site during the investigation, intermittent Sassman Gulch (dry during the investigation) was located more than 1,000 feet south of the site; consequently, no surface water samples were collected.
- Potential safety hazards identified at the site include a 15 feet tall loadout wall and an eroding tailings pile (TP-6); however, the majority of the site was surrounded by a fence.

**Tungsten Millsite PA#01-170**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 09/13/93**

**SOLID MATRIX ANALYSES**

**Metals in soils Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Total Petroleum Hydrocarbons (mg/Kg)
01-170-TP-1	7.5 J	89.2	0.89 U	7.35	11.6	107	32500	0.055 J	4380	10.1	17.9	6.39 J	119	NR
01-170-TP-2	107 J	2620	0.73	17.8	7.94	123	17600	0.475 J	14900	29.5	35.1	19.9 J	79.6	NR
01-170-TP-3	5.58 J	88.9	1.48	7.5	9.78	189	38200	0.087 J	4670	10.4	31.5	6.59 UJ	125	NR
01-170-TP-4	12.6 J	41.6	2.81	12.7	15.5	567	62500	0.143 J	5310	16.5	123	6.78 UJ	154	611
01-170-TP-5	8.03 J	134	1.72	16.2	16.5	331	47900	0.072 J	7000	21.8	7.36	10.5 J	468	NR
01-170-WR-1	6.28 J	40.9	2.29	9.59	6.08	2380	28600	0.055 J	2310	10.7	8.87	18.5 J	323	NR
BACKGROUND	56	169	0.8 JX	13.8	29.4	34.2	25300	0.014 U	462	26	30	4 UJ	119	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	ORGANIC SULFUR %	PYRITIC SULFUR V/1000	PYRITIC ACID BASE POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000
01-170-TP-1	<0.01	0	165	165	0.02	0	0	165
01-170-TP-2	<0.01	0	47.7	47.7	<0.01	0	0	47.7
01-170-TP-3	0.01	0.31	125	125	0.01	0	0	125
01-170-TP-4	0.03	0.94	135	134	0.02	0	0	135
01-170-TP-5	0.06	1.87	206	204	0.01	0	0	206
01-170-WR-1	<0.01	0	131	131	<0.01	0	0	131

**WATER MATRIX ANALYSES**

**Metals in Water Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
01-170-GW-1	3.39	97.5	4.59 U	5 U	6.24 U	2.33 U	53.1	0.12 U	3.76 U	10.9 U	1.22 U	31.7 U	8.71 U	309
01-170-GW-2	2.09	29.1	4.59 U	5 U	6.24 U	2.33 U	24.4	0.15 J	4.6	10.9 U	2.17	31.7 U	69.3	175

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	TOTAL PETROLEUM HYDROCARBONS (mg/L)
01-170-GW-1	408	31	60	0.64	23.3
01-170-GW-2	234	9	16	0.4	NR

**LEGEND**

- TP1 - Composite of subsamples TP1A, 1B, and 1D.
- TP2 - Sample of the TP1C subsample.
- TP3 - Composite of subsamples TP2A, 2B, 2C, 3A, 3B, 3C, 4A, and 4B.
- TP4 - Sample of the TP4C subsample.
- TP5 - Sample of the TP6A subsample.
- WR1 - Composite of subsamples WR1A and 1B.
- BACKGROUND - From the Emma Mine (29-061-SB-1).
- GW1 - Downgradient sample at trailer, below tailings pond 8.
- GW2 - Water supply well for mill, converted to residence.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Clara</u>	County: <u>Beaverhead</u>
Legal Description: T <u>3S</u> R <u>14W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 18</u>
Mining District: <u>Wisdom</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 34' 43"</u>	Primary Drainage: <u>Sleek Creek</u>
Longitude: <u>W 113° 22' 38"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Dry Gulch</u>
Quad: <u>Highland Ranch</u>	Date Investigated: <u>August 13, 1993</u>
Inspectors: <u>Bullock, Tuesday, Belanger</u>	P.A. # <u>01-262</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings identified to be associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 2,185 cubic yards. The following elements were elevated at least three times background:

Barium: 622 mg/kg	Mercury: 1.1 mg/kg
Cadmium: 6.1J mg/kg	Lead: 145 mg/kg
Copper: 86.8 mg/kg	Iron: 39,300 mg/kg
Zinc: 995 mg/kg	
- There was one discharging adit identified at this site and it was characterized by sample GW-1. The pH of GW-1 was 7.02 and specific conductance was 240 umhos/cm. No MCLs or MCLGs were exceeded. The acute aquatic life criteria for cadmium was exceeded. Chronic aquatic life criteria were exceeded for lead. The adits discharge flows over a portion of Waste Rock Dump #1, prior to seeping back into the ground.
- Two surface water samples were collected from Dry Gulch, one up gradient and one down gradient represented by SW-2 and SW-1 respectively. Observed releases were documented for copper, iron, lead and zinc, all directly attributable to this site. The MCL/MCLG for lead was exceeded in SW-1. The acute aquatic life standard for iron and zinc were exceeded in SW-1. Chronic aquatic life criteria were exceeded for copper and zinc in SW-1.
- Several safety hazards were found to be present at this site including the collapsed shaft, a structure near the shaft, and a cabin. Access to this site was unrestricted.

Clara PA# 01-262  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/13/93

# SOLID MATRIX ANALYSES

## Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-262-SE-1	7 U	173	1 J	4.5	5.8	8.3	11800	0.061 U	249	4 U	12 U	9 U	49	NR
01-262-SE-2	8 U	48.5	0.8 U	3.1 U	2.6	2.6	6390	0.045 U	140	4 U	14	10 U	40	NR
01-262-WR-1	14 U	622	6.1 J	6.6	4.1 U	86.8	39300	1.1	1990	8	145	18 U	995	NR
BACKGROUND	6	178	0.5 U	4.5	4	3.4	11400	0.027 U	880	4	10	6 U	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

## Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT.	1/1000
01-262-WR-1DUP	0.01	0.31	33.0	32.4	32.7	32.4	0.01	<0.01	0.01	<0.01	0.00	0.00	33.0	32.4
01-262-WR-1	<0.01	0.00	32.4	32.4	32.4	32.4	<0.01	<0.01	<0.01	<0.01	0.00	0.00	32.4	32.4

# WATER MATRIX ANALYSES

## Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
01-262-GW-1	2.64	153	3.27	9.7 U	6.83 U	7.7 J	162	0.160	87.7	12.7 U	2.62	30.7 U	40.7	84
01-262-SW-1	9.37	140	2.57 U	9.7 U	6.83 U	17.2 J	3100	0.250	434	165	2.32	30.7 U	204	122
01-262-SW-2	2.15	49	2.57 U	9.7 U	6.83 U	1.55 U	203	0.180	6.97	12.7 U	0.72 U	30.7 U	7.57 U	57.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

## Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE	
	209	330	5.0	10.0	23	15	< 0.05	< 0.05	NR	NR
01-262-GW-1	209	330	5.0	10.0	23	15	< 0.05	< 0.05	NR	NR
01-262-SW-1	330	330	10.0	10.0	15	15	< 0.05	< 0.05	NR	NR
01-262-SW-2	181	181	8.0	8.0	22	22	< 0.05	< 0.05	NR	NR

## LEGEND

SE1 - Downgradient of site on Dry Gulch.

SE2 - Upgradient of site in Dry Gulch.

WR1 - Composite of subsamples WR1A, 1B, 2, and 3.

BACKGROUND - From the Clara Mine (01-262-SS-1).

WR1DUP - Duplicates of the 01-262-WR-1 sample.

GW1 - Discharge from edit associated with waste rock dump 3.

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Martin</u> Legal Description: T <u>3S</u> R <u>13W</u> Mining District: <u>Wisdom</u> Latitude: <u>N 45° 33' 32"</u> Longitude: <u>W 113° 15' 23"</u> Land Status: <u>Public</u> Quad: <u>Stewart Mountain</u> Inspectors: <u>Bullock, Tuesday</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Beaverhead</u> Section(s): <u>NE 1/4, NW 1/4, Sec. 19</u> Mine Type: <u>Hardrock/Cu, Pb, Ag, Au</u> Primary Drainage: <u>Warm Spring Creek</u> USGS Code: <u>10020004</u> Secondary Drainage: <u>E. Fk. Warm Spring Ck.</u> Date Investigated: <u>September 9, 1993</u> P.A. # <u>01-270</u>
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- There were no mill tailings found to be associated with this site.
  
- The volume of waste rock associated with this site was estimated at 1,100 cubic yards. The following elements were elevated at least three times background:

Arsenic: 15.6 mg/kg	Lead: 1850 mg/kg
Cadmium: 10.8 mg/kg	Antimony: 18J mg/kg
Copper: 177J mg/kg	Zinc: 1240 mg/kg
Mercury: 9.26 mg/kg	
  
- There was one discharging adit identified at this site. The flow was approximately 1.5 gpm with a pH of 6.9. No MCLs or MCLGs were exceeded. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc.
  
- The East Fork of Warm Spring Creek flowed along the western end of this site. An observed release was documented for zinc. The acute aquatic life criteria were exceeded for copper and zinc, and the chronic aquatic life criteria were exceeded for zinc; these exceedances were attributable to the site.
  
- There were six standing or partially collapsed cabins at this site that present a safety hazard.

Martin PA# 01-270  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
01-270-SE-1	6.24 U	49.5 J	0.7 U	3.71 J	1.76	5.86 J	11800	0.104	285 J	3.35 U	27.9	8.13 UJ	52.5	NR
01-270-SE-2	4.67 U	79.1 J	0.5 U	4.97 J	2.28	3.57 J	11300	0.038 U	321 J	2.51 U	8.01 U	6.09 UJ	33.7	NR
01-270-WR-1	15.6	143 J	10.8	5.41 J	2.08	177 J	12100	9.26	398 J	1.86 U	1850	18 J	1240	NR
BACKGROUND	5.08	84.5 J	0.4 U	6.91 J	10.1	7.2 J	12500	0.031 U	403 J	3.54	6.85 U	5.21 UJ	37.8	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	POTENT.	ACID BASE	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	SULFUR	ACID BASE	POTENT.	ACID BASE
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
01-270-WR-1	0.01	0.31	9.45	9.14	<0.01	<0.01	<0.01	0.01	0.01	0	0	9.45		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
01-270-GW-1	3.72 JX	20.2	2.7	9.7 U	6.83 U	23.3	767	0.28	59.2	12.7 U	53	30.7 UJ	162	17.8
01-270-SW-1	3.18 JX	8.4	2.57 U	9.7 U	6.83 U	2.13	633	0.15	24.5	12.7 U	1.78	30.7 UJ	28.4	10.3
01-270-SW-2	1.34 JX	4.7	2.57 U	9.7 U	6.87	1.55 U	24.8	0.17	4.08 UJ	12.7 U	2.9	30.7 UJ	7.57 U	8.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
01-270-GW-1	81	< 5.0	< 5.0	0.12	NR
01-270-SW-1	55	< 5.0	< 5.0	< 0.05	NR
01-270-SW-2	47	< 5.0	< 5.0	< 0.05	NR

LEGEND

- SE1 - Downstream of waste rock dump 3 on East Fork Warm Spring Creek.  
SE2 - Upstream of site on East Fork Warm Spring Creek.  
WR1 - Composite of subsamples WR1A, 1B, 2, 3A, and 3B.  
BACKGROUND - From the Martin Mine (01-270-SS-1).
- GW1 - Large collapsed edit in drainage.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Miller</u>	County: <u>Broadwater</u>
Legal Description: T <u>10N</u> R <u>2E</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 13</u>
Mining District: <u>Confederate</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 37' 12"</u>	Primary Drainage: <u>Confederate Gulch</u>
Longitude: <u>W 111° 24' 58"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Greehorn Gulch</u>
Quad: <u>Diamond City</u>	Date Investigated: <u>July 26, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>04-138</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings on site.
- There were approximately 11,950 cubic yards of mostly uncovered waste rock on site. The following were elevated at least three times background:

Cadmium: 3.2 to 4.1 mg/kg	Copper: 91.8 to 2,520 mg/kg
Iron: 52,600 to 54,600 mg/kg	Mercury: 1.57J to 2.46J mg/kg
Manganese: 1,540 mg/kg	Lead: 89 to 2,960 mg/kg
Zinc: 250 mg/kg	
- There was a discharging adit on site that entered the gulch; the pH measurement was 5.23. The MCL for nickel and the acute and chronic aquatic life criteria for copper and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron and mercury were exceeded in the adit discharge.
- Adit discharge flowed over waste rock and made up the entire flow of Greenhorn Gulch. The gulch flowed into Confederate Gulch 1.5 miles away.
- There were several open or partially open adits and hazardous structures on site.

Miller PA# 04-138  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-138-SE-1	9	109	1.6	8.6	16.1	30.3	27100	0.221 J	365	21 J	59	7 UJ	125	NR
04-138-WR-1	10	152	1.6	5.5	7.4	91.8	29200	1.57 J	247	14 J	135	7 UJ	102	NR
04-138-WR-2	24	156	3.2	13.5	5.2	902	54600	2.46 J	452	10 J	89	6 UJ	59	NR
04-138-WR-3	27	293	4.1	13.8	8.3	2520	52600	2.39 J	1540	26 J	2960	6 UJ	250	NR
BACKGROUND	20	98.5	0.8	5.8	11.9	21.6	14100	0.042 J	419	10 J	22	6 UJ	66	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
04-138-WR-1	1.38	43.1	48.6	5.45	0.46	0.59	0.33	18.4	0.33	18.4	0.33	18.4	0.33	18.4	0.33	30.1
04-138-WR-2	0.57	17.8	32.1	14.3	0.14	0.16	0.27	5.00	0.27	5.00	0.27	5.00	0.27	5.00	0.27	27.1
04-138-WR-3	0.24	7.50	21.4	13.9	0.12	0.06	0.06	1.87	0.06	1.87	0.06	1.87	0.06	1.87	0.06	19.5

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.
04-138-SW-1	1	2.01 U	2.57 U	78.8	6.83 U	189	83300	0.13	7000 J	145	7.03	30.7 U	1920	1090

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-138-SW-1	1810	< 5.0	1160	< 0.05	NR

LEGEND

SE1 - 500 feet from waste rock dump 1 in Greenhorn Gulch.  
WR1 - Composite of subsamples WR1, 2A, and 2B.  
WR2 - Composite of subsamples WR3A, 3B, and 3C.  
WR3 - Composite of subsamples WR4, 5, and 6.  
BACKGROUND - From the Hummingbird Mine (04-144-SB-1).

SW1 - Discharge from edit #1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Argo Mine and Millsite</u>	County: <u>Broadwater</u>
Legal Description: T <u>11N</u> R <u>1E</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 27</u>
Mining District: <u>Hellgate</u>	Mine Type: <u>Hardrock/Cu</u>
Latitude: <u>N 46° 41' 16"</u>	Primary Drainage: <u>Missouri River</u>
Longitude: <u>W 111° 33' 52"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Hellgate Gulch</u>
Quad: <u>Hellgate Gulch</u>	Date Investigated: <u>July 26, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>04-015</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 9,000 cubic yards. The following elements were elevated at least three times background:  
Copper: 7,810 mg/kg  
Mercury: 0.562J mg/kg
- The volume of waste rock associated with this site was estimated to be 14,400 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 2.2 mg/kg  
Copper: 58,200 mg/kg  
Iron: 55,100 mg/kg  
Mercury: 0.511J mg/kg  
Nickel: 31J mg/kg  
Lead: 59 mg/kg
- There were no adit discharges, seeps or springs identified at this site.
- Hellgate Gulch Creek was flowing through and around this site. Storm water was observed running off the tailings directly into Hellgate Creek. Surface water samples were collected from Hellgate Creek above the site and below the majority of the workings, just upstream from the Harris Gulch confluence. An observed release was documented for copper. No MCL/MCLGs were exceeded. In addition, no acute or chronic aquatic life criteria were exceeded.
- Adit #1 did have a gate, but it was not locked and was determined to present a potential safety hazard. The mill and the cabin at WR-2 were identified as hazardous structures.

Argo PA# 04-015  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-015-SE-1	11	33.7	0.9	4.3	6.9	2240	15400	0.013 J	299	12 J	22	6 UJ	42	NR
04-015-SE-2	8	39.7	0.9	5.4	5.9	14.8	14900	0.017 J	244	12 J	19	6 UJ	54	NR
04-015-TP-1	5	35.6	1.4	4.4	3.1	7810	18000	0.562 J	288	8 J	30	7 UJ	25	NR
04-015-WR-1	14	34.1	2.2	6.8	5.2	58200	55100	0.511 J	201	31 J	59	6 UJ	40	NR
BACKGROUND	16	225	0.6	4.7	4.5	52.4	8640	0.023 J	410	5 J	14	7 UJ	39	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE POTENT.	
	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x
04-015-TP-1	0.99	30.9	77.9	77.9	47.0	47.0	<0.01	<0.01	0.04	0.04	0.97	0.97	1.25	1.25	76.6	76.6
04-015-WR-1	1.14	35.6	62.9	62.9	27.3	27.3	<0.01	<0.01	0.22	0.22	1.08	1.08	6.87	6.87	56.0	56.0

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
04-015-SW-1	0.96 U	29.6	2.57 U	9.7 U	6.83 U	22.9	388	0.09	14.8 J	12.7 U	3.34	30.7 U	7.57 U	318
04-015-SW-2	0.96 U	25.5	2.57 U	9.7 U	6.83 U	1.55 U	220	0.14	10.2 J	12.7 U	2.45	30.7 U	7.57 U	314

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-015-SW-1	380	< 5.0	59	< 0.05	NR
04-015-SW-2	349	5.7	53	< 0.05	NR

LEGEND

- SE1 - Downgradient from most of the site, but upgradient of Harris Gulch confluence.  
SE2 - Upgradient of site; 200' above trail head.  
TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1B-A, 1B-B, and 1B-C.  
WR1 - Composite of subsamples WR1A, 1B, and 2A.  
BACKGROUND - From the Argo (04-015-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Park</u>	County: <u>Broadwater</u>
Legal Description: T <u>7N</u> R <u>1W</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 15</u>
Mining District: <u>Indian Creek</u>	Mine Type: <u>Hardrock/Au, Pb, Ag</u>
Latitude: <u>N 46° 21' 53"</u>	Primary Drainage: <u>Indian Creek</u>
Longitude: <u>W 111° 42' 21"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Indian Creek</u>
Quad: <u>Giant Hill</u>	Date Investigated: <u>July 27, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>04-012</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 60 cubic yards. The impoundments were breached and the majority of the volume of tailings have washed down the drainage. The following elements were elevated at least three times background:  
Arsenic: 1,260J mg/kg                      Lead: 4,160 mg/kg  
Cyanide was also at 0.292U mg/kg.
- The volume of waste rock associated with this site was estimated to be approximately 65,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 4,730J to 9,820J mg/kg              Mercury: 0.59J to 0.713J mg/kg  
Cadmium: 14 to 101 mg/kg                      Lead: 8270 to 13,100 mg/kg  
Chromium: 86J mg/kg                              Antimony: 33J mg/kg  
Copper: 159J to 308J mg/kg                      Zinc: 1,220J to 2,230J mg/kg
- There were three discharging adits identified at this site, the most significant of which was characterized by sample GW-1. GW-1 had a measured discharge of 0.6 cfs, a pH of 4.29, and a specific conductance of 270 umhos/cm. The MCL/MCLGs for arsenic and cadmium were exceeded. Acute aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc. Chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, iron, lead, mercury, and zinc. There was one significant seep associated with this site which was sampled as GW-2. This seep was discharging from the toe of WR-2 at an estimated flow of 35 gpm, a pH of 2.93 and a specific conductance of 1380 umhos/cm. The MCL/MCLGs for arsenic, cadmium, and antimony were exceeded. Acute aquatic life criteria were exceeded for arsenic, cadmium, copper, and zinc. Chronic aquatic life criteria were exceeded for arsenic, iron, copper, lead, and zinc.
- Indian Creek and a small perennial tributary into the creek were identified to be associated with this site. Observed releases were documented for arsenic, cadmium, lead, and zinc, which were directly attributable to this site. MCL/MCLGs were exceeded for arsenic and cadmium, which were directly attributable to the site. Acute aquatic life criteria were exceeded for cadmium, copper, and zinc. Chronic aquatic life criteria were exceeded for cadmium, copper, lead, mercury, and zinc.

Park PA# 04-012  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/27/93

# SOLID MATRIX ANALYSES

## Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-012-SE-1	4350 J	84.7	25	17.7 J	13 J	56.9 J	30600	0.144 J	1690 J	7 J	1850	9 UJ	2050 J	NR
04-012-SE-2	11 J	112	0.5 U	8.2 J	11 J	11.4 J	14500	0.064 J	399 J	8 J	11	6 UJ	46 J	NR
04-012-TP-1	1260 J	66	1	2.1 J	3 J	48.9 J	35500	0.056 J	143 J	3 UJ	4180	7 J	190 J	0.292 U
04-012-WR-1	4730 J	59.9	14	7.9 J	6 J	159 J	65700	0.59 J	790 J	2 UJ	8270	19 J	1430 J	NR
04-012-WR-2	8900 J	50.4	18	6.6 J	7 J	202 J	58900	0.713 J	781 J	2 UJ	12800	27 J	1220 J	NR
04-012-WR-3	9820 J	30.1	101	16 J	86 J	308 J	71200	0.137 J	702 J	2 J	13100	33 J	2320 J	NR
BACKGROUND	44 J	315	1 U	24 J	15 J	28.9 J	37600	0.088 J	1220 J	9 J	31	11 UJ	112 J	NR

## Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE %/1000	NEUTRAL POTENT. %/1000	SULFUR ACID BASE POTENT. %/1000	SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE %/1000	SULFUR ACID BASE POTENT. %/1000
04-012-TP-1	2.00	62.5	-0.00	-82.5	1.97	0.03	<0.01	0.00	-0.00
04-012-WR-1	4.02	126	20.6	-105	0.37	1.85	2.00	62.5	-41.8
04-012-WR-2	1.25	39.0	-0.62	-39.7	0.82	0.33	0.10	3.12	-3.74
04-012-WR-3	0.20	6.25	2.58	-3.67	0.13	0.05	0.02	0.62	1.96

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

# WATER MATRIX ANALYSES

## Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-012-GW-1	548	2.01 U	44.7	9.7 U	6.83 U	64.2	3450	0.16	842 J	12.7 U	104	30.7 U	5710	81
04-012-GW-2	3380	7.6	563	134	6.83 U	975	32600	0.083	19900 J	36.8	252	93.7	73600	374
04-012-SW-1	71	15	11	9.7 U	6.83 U	15.6	902	0.055	324 J	12.7 U	19.4	30.7 U	1540	38.7
04-012-SW-2	1.69 U	30.3	2.57 U	9.7 U	6.83 U	7.43 J	308 J	0.093	14.5	13.2	1.55 U	30.7 U	46.1 JX	21
04-012-SW-3	215	10.8	30.6	9.7 U	6.83 U	42.1 J	1700 J	0.11	495	12.7 U	31.2	30.7 U	3620 JX	62.4

## Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-012-GW-1	203	< 5.0	104	0.39	NR
04-012-GW-2	1270	< 5.0	800	0.31	<0.005
04-012-SW-1	121	< 5.0	30	0.08	<0.005
04-012-SW-2	105	< 5.0	< 5	< 0.05	NR
04-012-SW-3	167	< 5.0	76	0.19	NR

## LEGEND

- SE1 - Downgradient Indian Creek.  
SE2 - Upgradient Indian Creek.  
TP1 - Composite of subsamples TP1 and 2.  
WR1 - Composite of subsamples WR1A, 1B, 2A, 2B, and 2C.  
WR2 - Composite of subsamples WR2A, 4A, 4B, 4C, 5A, 6A, 6B, 7A, and 9A.  
WR3 - Sample of the WR3 subsample.  
BACKGROUND - From the Park Mine (04-012-SW-1).
- GW1 - Add discharge at waste rock dump 2.  
GW2 - Seep below mill.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Eastern tributary prior to confluence.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

<b>Mine/Site Name:</b> <u>St. Louis</u> <b>Legal Description:</b> T <u>7N</u> R <u>1W</u> <b>Mining District:</b> <u>Indian Creek</u> <b>Latitude:</b> <u>N 46° 20' 19"</u> <b>Longitude:</b> <u>W 111° 41' 55"</u> <b>Land Status:</b> <u>Private/Public</u> <b>Quad:</b> <u>Giant Hill</u> <b>Inspectors:</b> <u>Bullock, Clark/Pierson</u> <b>Organization:</b> <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	<b>County:</b> <u>Broadwater</u> <b>Section(s):</b> <u>NW 1/4, NW 1/4, Sec.26</u> <b>Mine Type:</b> <u>Hardrock/Ag. Au, Pb</u> <b>Primary Drainage:</b> <u>Indian Creek</u> <b>USGS Code:</b> <u>10030101</u> <b>Secondary Drainage:</b> <u>West Fork Indian Creek</u> <b>Date Investigated:</b> <u>July 27, 1993</u> <b>P.A. #</b> <u>04-013</u>
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- There were no mill tailings observed at this site during the investigation.
  
- The volume of leach pad material associated with this site was estimated to be approximately 1,300 cubic yards. The concentration of cyanide measured in a sample of the leach pad material was 5.27 mg/kg. The following elements were elevated at least three times background:  
Arsenic: 2,110J mg/kg      Lead: 1,110 mg/kg  
Cadmium: 9 mg/kg      Zinc: 1,180J mg/kg  
Copper: 202J mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 17,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 4,840 mg/kg      Lead: 2,590 mg/kg  
Cadmium: 38 mg/kg      Zinc: 1,540J mg/kg  
Copper: 316J mg/kg
  
- No MCLs were exceeded in upstream or downstream surface water samples collected from West Fork Indian Creek; however, chronic aquatic life criteria were exceeded for mercury in both the upstream and downstream samples, and the chronic aquatic life criteria for lead was exceeded in the downstream sample.
  
- Observed releases to West Fork Indian Creek were documented for arsenic and lead. The chronic aquatic life criteria exceedance for lead was directly attributable to the site. Additionally, significant increases in lead and zinc concentrations (greater than three times) were observed in downstream sediment samples collected from West Fork Indian Creek (compared to upstream concentrations).
  
- Potentially hazardous structures that were observed at the site included a trench highwall (20 to 40 feet high) and three small unstable buildings.

St Louis PA# 04-013  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - Bullock  
INVESTIGATION DATE: 07/27/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-013-LP-1	2110 J	47.6	9	7.9 J	5 J	202 J	33900	0.184 J	307 J	5 J	1110	7 J	1180 J	5.27
04-013-SE-1	22	78.4	2.6	7.1	7	19.1	22100	0.035 J	277	3 J	318	6 UJ	368	NR
04-013-SE-2	11	34.2	0.9	11	5.9	7.2	18600	0.017 J	335	5 J	15	6 UJ	60	NR
04-013-WR-1	4840 J	81.6	38	9 J	4 J	316 J	37500	0.164 J	776 J	4 J	2590	7 J	1540 J	NR
BACKGROUND	44 J	315	1 U	24 J	15 J	28.9 J	37600	0.088 J	1220 J	9 J	31	11 UJ	112 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
04-013-LP-1	0.74	23.1	13.6	-9.52	0.56	0.25	7.81	5.78
04-013-WR-1	0.35	10.9	8.29	-2.64	0.03	<0.01	0.00	8.29

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
04-013-SW-1	3	< 16.6 U	2.57 U	9.7 U	6.83 U	1.55 U	666	0.044	18.3 J	12.7 U	13.1	30.7 U	20.7 U	74.7
04-013-SW-2	0.96 U	7.67	2.57 U	9.7 U	6.83 U	1.55 U	44.5	0.052	9.1 J	12.7 U	1.86	30.7 U	7.57 U	71.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-013-SW-1	150	< 5.0	13	0.13	< 0.01
04-013-SW-2	151	< 5.0	10	0.47	NR

LEGEND

LP1 - Composite LP1A and 1B (Leach Pad)  
SE1 - Downgradient on West Fork Indian Creek  
SE2 - Upgradient on West Fork Indian Creek  
WR1 - Sample of the WR1 subsample  
BACKGROUND - From the Park Mine (04-012-SS-1)  
SW1 - Same as sample SE1  
SW2 - Same as sample SE2



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Diamond Hill</u>	County: <u>Broadwater</u>
Legal Description: T <u>7N</u> R <u>1W</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 36</u>
Mining District: <u>Indian Creek</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 18' 48"</u>	Primary Drainage: <u>Indian Creek</u>
Longitude: <u>W 111° 40' 38"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>West Fork Indian Creek</u>
Quad: <u>Giant Hill</u>	Date Investigated: <u>July 28, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>04-020</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 220 cubic yards of uncovered tailings on site. The following were elevated at least three times background:  
Copper: 181J mg/kg  
Mercury: 3.38J mg/kg
- There were 75,000 cubic yards of mostly uncovered waste rock on site. The following was elevated at least three times background:  
Mercury: 0.369J to 0.61J mg/kg
- There were no discharging adits on site. There was one monitoring well located on site; no MCLs/MCLGs were exceeded.
- Tailings were located adjacent to the West Fork of Indian Creek; however, no MCLs/MCLGs or acute or chronic aquatic life criteria were exceeded which were attributable to the site.
- An observed release to the West Fork of Indian Creek (sediment) was documented for mercury.
- There were numerous hazardous openings and pits located on site.

**Diamond Hill PA# 04-020**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/28/93**

**SOLID MATRIX ANALYSES**

**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Ct (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-020-SE-1	78 J	165	2	20.6 J	12 J	107 J	39400	0.158 J	419 J	13 J	285	11 UJ	300 J	0.622 U
04-020-SE-2	20 J	75.8	0.6 U	9.4 J	8 J	120 J	27000	0.526 J	226 J	3 J	36	9 J	49 J	0.335 U
04-020-TP-1	44 J	73	1.3	14.3 J	3 J	181 J	51200	3.38 J	366 J	2 UJ	15	6 UJ	46 J	0.291 U
04-020-WR-1	23 J	56.8	0.9	5.8 J	5 J	67.4 J	52400	0.61 J	119 J	17 J	14	7 UJ	7 J	NR
04-020-WR-2	76 J	55.4	0.5	18.4 J	3 J	88.7 J	39200	0.369 J	526 J	3 J	13	5 UJ	47 J	NR
BACKGROUND	44 J	315	1 U	24 J	15 J	28.9 J	37600	0.088 J	1220 J	9 J	31	11 UJ	112 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
04-020-TP-1	1.29	40.3	7.45	-32.9	1.13	0.09	0.07	2.81	4.64
04-020-WR-1	2.64	82.5	-1.86	-84.3	2.52	0.02	0.10	0.62	-2.49
04-020-WR-2	0.97	30.3	12.2	-18.1	0.89	0.02	0.06	0.62	11.6

**WATER MATRIX ANALYSES**

**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-020-GW-1	1.69 U	22.3	2.57 U	9.7 U	6.83 U	5.27 J	23 J	0.072	4.08 U	12.7 U	1.55 U	30.7 U	23.5 JX	232
04-020-GW-2	3.03	22.4	2.57 U	9.7 U	6.83 U	5.33 J	23 J	0.1	4.08 U	12.7 U	1.55 U	30.7 U	17.7 JX	239
04-020-SW-1	4.62	20.8	2.57 U	9.7 U	6.83 U	5.47 J	310 J	0.096	31.4	12.7 U	6.36	30.7 U	22.4 JX	96.8
04-020-SW-2	4.37	20.2	2.57 U	9.7 U	6.83 U	5.1 J	211 J	0.12	13.6	12.7 U	3.73	30.7 U	18.5 JX	103

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-020-GW-1	375	6.7	98	0.82	NR
04-020-GW-2	385	7.2	99	0.79	NR
04-020-SW-1	188	< 5.0	37	0.05	< 0.01
04-020-SW-2	195	< 5.0	38	< 0.05	< 0.01

**LEGEND**

SE1 - Upgradient on West Fork Indian Creek.  
 SE2 - Downgradient on West Fork Indian Creek.  
 TP1 - Composite of subsamples TP1A-A, B, TP1B-A, and B.  
 WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 WR2 - Composite of subsamples WR2, WR4, WR6, WR9, and WR11.  
 BACKGROUND - From Park (Marietta) (04-012-S91).

GW1 - Monitoring well at mouth of Engh Pt by edit 3.  
 GW2 - Duplicate of GW1.  
 SW1 - Same as SE1.  
 SW2 - Same as SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bullion King</u>	County: <u>Broadwater</u>
Legal Description: T <u>7N</u> R <u>1W</u>	Section(s): <u>SE 1/4, SE 1/4, Section 10: NW 1/4,</u>
Mining District: <u>Indian Creek</u>	<u>NW 1/4, Section 14: NE 1/4, NE 1/4, Section 15</u>
Latitude: <u>N 46° 22' 12"</u>	Mine Type: <u>Hardrock/Ag. Pb. Au</u>
Longitude: <u>W 111° 42' 12"</u>	Primary Drainage: <u>Missouri River</u>
Land Status: <u>Private</u>	USGS Code: <u>10030101</u>
Quad: <u>Giant Hill</u>	Secondary Drainage: <u>Indian Creek</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	Date Investigated: <u>June 20, 1994</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>04-081</u>

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 6,745 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 3,190 mg/kg	Cadmium: 11.8J mg/kg
Copper: 91.5 to 1,320 mg/kg	Mercury: 0.98JX to 1.51JX mg/kg
Manganese: 37,100 mg/kg	Lead: 8,160 to 47,900 mg/kg
Zinc: 350J to 1,070J mg/kg	
- One discharging adit was observed at the site during the investigation. The discharge flowed approximately 200 feet before seeping into the ground. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded in the adit discharge.
- No significant sources of surface water were on or near the site.
- Potential safety hazards observed at the site included two unstable trenches and one caved shaft with steep slopes.

**Bullion King PA# 04-081**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 08/20/94**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-081-WR1	43.9	77.3	179	11.8 J	20.8	4.7	1320	59400	1.51 JX	37100	1.5 U	47900	28.3 J	1070 J	NR
04-081-WR2	31.9	3190	104	1.1 J	4.1	5.3	91.5	59200	0.98 JX	290	1.4 U	8160	5.8 J	350 J	NR
BACKGROUND	NR	44 J	315	1.0 U	24.0 J	15.0 J	28.9 J	37600	0.086 J	1220 J	9.05 J	31	11.0 UJ	112 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		TOTAL SULFUR		SULFUR		SULFUR		PYRITIC SULFUR		PYRITIC SULFUR		SULFUR	
	%	1/1000	ACID BASE	POTENT.	NEUTRAL.	POTENT.	ACID BASE	POTENT.	SULFATE	%	ACID BASE	POTENT.	ACID BASE	POTENT.
04-081-WR1	0.98	30.0	49.0	-1.05	49.0	19.0	0.10	0.40	0.40	0.40	0.40	0.40	12.5	36.5
04-081-WR2	2.04	63.7				-65	1.32	0.20	0.20	0.20	0.20	0.20	6.25	-7.30

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-081-AD1	0.12 U	12.3	3.6	4.9	8.7 U	4.7 UX	50.0	725	0.18	83.1	8.0 U	13.0 J	29.4 U	712	49.0
04-081-GW1	0.12 U	1.1 U	4.5	2.6 U	8.7 U	4.7 UX	4.6 U	45.7	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	5.77	29.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-081-AD1	4.0	<5.0	48	0.65	NR
04-081-GW1	60	<5.0	7.0	0.15	NR

**LEGEND**

WR1 - Composite of WR1A through 1C.  
 WR2 - Composite of WR2A through 2C and 3.  
 BACKGROUND - From the Peak Meter (94-013.581) (1993 data).

AD1 - All discharge water.  
 GW1 - No. 2 leach discharge, wet.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Ohio  
Legal Description: T 5N R 1W  
Mining District: Radersburg  
Latitude: N 46° 11' 08"  
Longitude: W 111° 40' 07"  
Land Status: Private  
Quad: Radersburg  
Inspectors: Bullock, M. Babits, S. Babits,  
Flammang/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Broadwater  
Section(s): NW 1/4, SE 1/4, Sec. 13  
Mine Type: Hardrock/Au  
Primary Drainage: Crow Creek  
USGS Code: 10030101  
Secondary Drainage: Keating Gulch  
Date Investigated: September 3, 1993  
P.A. # 04-009

- The volume of tailings associated with this site was estimated to be 37,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 203J to 321J mg/kg      Iron: 79,600J mg/kg  
Cobalt: 32.2 to 86.3 mg/kg      Mercury: 0.35J to 0.595J mg/kg  
Copper: 142 to 350 mg/kg      Zinc: 207J to 333J mg/kg
- The volume of waste rock associated with this site was estimated to be 19,500 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 136J mg/kg      Iron: 75,400J mg/kg  
Cobalt: 29.4 mg/kg      Mercury: 0.622J mg/kg  
Copper: 98.4 mg/kg      Lead: 189J mg/kg
- There were no adit discharges, seeps or springs associated with this site.
- Keating Gulch flowed to the north of this site. No observed water releases were attributable to this site. No MCLs or MCLGs, or acute or chronic aquatic life criteria were exceeded. Sediment samples were collected up and down stream of this site. Observed releases of arsenic, copper, and iron were documented; directly attributed to this site.
- The shaft and adit on the north side of Keating Gulch were identified as hazard mine openings. In addition, the loadout and several of the cabins were classified as hazardous structures.

Ohio PA# 04-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-009-SE-1	8.63 J	55.3 J	0.9 U	7.53	3.96	22.6	17700 J	0.059 J	355	7.59 J	30.2 J	6.12 UJ	148 J	NR
04-009-SE-2	50.6 J	56.4 J	0.8 U	12.5	4.9	75.9	35300 J	0.071 J	295	7.85 J	29.4 J	5.76 UJ	85.5 J	NR
04-009-TP-1	321 J	36.3 J	1.1 U	86.3	8.35	350	79600 J	0.595 J	269	8.45 J	70.9 J	7.44 UJ	333 J	NR
04-009-TP-2	203 J	54 J	1.0 U	32.2	7.41	142	46000 J	0.35 J	264	5.82 J	50.1 J	6.56 UJ	207 J	NR
04-009-WR-1	136 J	94.1 J	0.7 U	29.4	3.07	98.4	75400 J	0.622 J	27.7	1.89 J	189 J	5.13 UJ	36.1 J	NR
BACKGROUND	6.11 J	214 J	1.0 U	8.92	6.14	22.6	19200 J	0.106 J	819	7.83 J	25.2 J	6.96 UJ	79.6 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000
04-009-TP-1	4.85	152	36.7	-115	3.11	-115	1.5	46.9	0.24	46.9	0.12	71.2	0.12	71.2	-10.1	-10.1
04-009-TP-2	3.44	107	39.9	-88	104	-88	2.26	71.2	0.12	71.2	0.12	95.9	0.12	95.9	-31.3	-31.3
04-009-WR-1	9.32	291	-16	-307	4.3	-307	3.07	95.9	1.95	95.9	1.95	-112	1.95	-112	-112	-112

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-009-SW-1	1.18 U	37.9	4.59 U	5 U	6.24 U	2.33 U	34.4	0.12 U	5.4	10.9 U	0.72 U	31.7 U	11.1	309
04-009-SW-2	1.18 U	33.4	4.59 U	5 U	6.24 U	2.33 U	85.9	0.12 U	3.76 U	10.9 U	0.93	31.7 U	9.33	281

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-009-SW-1	390	7.0	131	< 0.05	NR
04-009-SW-2	368	8.0	135	< 0.05	NR

LEGEND

- SE1 - 340 feet upgradient of mill building in Keating Gulch.  
SE2 - 400 feet downgradient in Keating Gulch.  
TP1 - Composite of subsamples TP1A-A, 2A-B, 2A-C, 2A-D, 2B-A, 2B-B, and 2B-C.  
TP2 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2A-D, 2B-A, 2B-B, and 2B-C.  
WR1 - Composite of subsamples WR1A through 1C, 2A, and 2B.  
BACKGROUND - 850 feet upgradient from mill building  
From the Ohio Mine (04-009-SB-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Keating Tailings</u>	County: <u>Broadwater</u>
Legal Description: T <u>5N</u> R <u>1E</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 18</u>
Mining District: <u>Radersburg</u>	Mine Type: <u>Hardrock/Au, Cu</u>
Latitude: <u>N 46° 11' 02"</u>	Primary Drainage: <u>Crow Creek</u>
Longitude: <u>W 111° 39' 34"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Keating Gulch</u>
Quad: <u>Radersburg</u>	Date Investigated: <u>September 3, 1993</u>
Inspectors: <u>M. Babits, S. Babits,</u>	P.A. # <u>04-121</u>
<u>Flammang/Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 144,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 143J to 336J mg/kg	Manganese: 3040 mg/kg
Copper: 378 to 486 mg/kg	Lead: 684J mg/kg
Iron: 43,200J to 55,200J mg/kg	Zinc: 251J to 2640J mg/kg
Mercury: 0.76J mg/kg	
- Waste rock associated with this site was located in an active mining area and was not investigated.
- There were no discharges associated with mine openings identified at this site. There was a spring located near the northeast corner of the toe of TP-2, which was characterized by sample SW-1. The flow of the spring was measured at 0.04 cfs with a pH of 6.6 and specific conductance of 470 umhos/cm. No MCLs or MCLGs were exceeded. In addition, no acute or chronic aquatic life criteria were exceeded.
- Keating Gulch, and intermittent stream, was dry at the time of this investigation. The stream channel had been diverted around the tailings impoundment. Sediment samples were collected in the dry gulch up gradient and down gradient from this site. No observed releases could be attributed to this site.
- Precipitation was ponded on the lower tailings pond.

Keating Tailings PA# 04-121  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-121-SE-1	26.7 J	50 J	0.7 U	13.1	6.48	52.5	21500 J	0.026 U	455	8.18 J	40.6 J	5.09 UJ	108 J	NR
04-009-SE-2	50.6 J	56.4 J	0.8 U	12.5	4.9	75.9	35300 J	0.071 J	295	7.85 J	29.4 J	5.76 UJ	85.5 J	NR
04-121-TP-1	143 J	128 J	0.9 U	9.52	11.6	378	43200 J	0.184 J	235	5.23 J	57.3 J	5.91 UJ	251 J	NR
04-121-TP-2	336 J	279 J	1.7	11.2	8.17	486	55200 J	0.76 J	3040	11.1 J	684 J	7.74 UJ	2640 J	NR
BACKGROUND	6.11 J	214 J	1.0 U	8.92	6.14	22.6	19200 J	0.106 J	819	7.83 J	25.2 J	6.96 UJ	79.6 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		SULFATE SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x
04-121-TP-1	1.81	56.5	-2	-59	1.29	-59	0.02	0.02	0.02	0.02	0.5	15.6	0.12 U	0.12 U	707	10.9 U
04-121-TP-1	1.8	56.2	-1.9	-58	1.28	-58	0.08	0.08	0.08	0.08	0.44	13.7	0.12 U	0.12 U	3.76 U	10.9 U
04-121-TP-2	0.93	29.1	7.93	-21	0.85	-21	0.05	0.05	0.05	0.05	0.03	0.94	0.12 U	0.12 U	6.99	10.9 U

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-121-SW-1	3.85	8.6	4.59 U	5 U	9.37 U	2.33 U	894	0.12 U	707	10.9 U	0.72 U	31.7 U	13.6	1050
04-009-SW-2	1.18 U	33.4	4.59 U	5 U	6.24 U	2.33 U	85.9	0.12 U	3.76 U	10.9 U	0.93	31.7 U	9.33	281

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-121-SW-1	1604	18	981	< 0.05	< 0.005
04-009-SW-2	366	8.0	135	< 0.05	NR

LEGEND

SE1 - Downgradient in Keating Gulch.  
SE2 - 400' downgradient of berm on tailing pond 2 of the Ohio Mine. This serves as the upgradient sample for 04-121.  
TP1 - Composite of subsamples TP1A-A, B, C, and 1B-A, B, C.  
TP2 - Composite of subsamples TP2A-A, B, C, and 2B-A, B.  
BACKGROUND - From the Ohio Mine (04-009-SW-1).  
TPIDUP - Duplicate of the sample 04-121-TP1.

SW1 - Spring at the toe of tailings pond 2.  
SW2 - Same as sample SE2.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Custer Millsite  
Legal Description: T 8N R 1W  
Mining District: Winston  
Latitude: N 46° 26' 48"  
Longitude: W 111° 39' 59"  
Land Status: Private  
Quad: Winston  
Inspectors: Tuesday, Belanger, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Broadwater  
Section(s): SE 1/4, Section 13  
Mine Type: Hardrock/Au, Pb, Zn  
Primary Drainage: Missouri River  
USGS Code: 10030101  
Secondary Drainage: Iron Age Gulch  
Date Investigated: June 22, 1994  
P.A. # 04-006

- The volume of tailings observed at the site was estimated to be 22,960 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 5.5 mg/kg	Nickel: 13.8 mg/kg
Arsenic: 535 mg/kg	Lead: 507 mg/kg
Cadmium: 8.6J mg/kg	Zinc: 1,640J mg/kg
Chromium: 17.7 mg/kg	Manganese: 2,810 mg/kg
- No waste rock was observed at the site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation; however, a groundwater monitoring well was sampled. No MCLs were exceeded in the well sample.
- No surface water or sediment samples were collected during the investigation due to the extended distance to the nearest surface water and the lack of a direct runoff route.
- Potential safety hazards observed at the site included a highwall located above the mill foundation.

Custer Millsite PA# 04-006  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/22/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-008-TP1	5.5	535	331	8.6 J	9.3	17.7	59.7	20100	0.04 JX	2810	13.8	507	9.2	1640 J	0.308
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
04-008-TP1	0.61	19.1	36.9	17.9	0.40	0.16	0.05	5.00	31.9							

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-008-GW1	0.12 U	1.1 U	17.1	2.6 U	8.7 U	4.7 JX	4.6 U	9.4 U	0.11 U	53.2	8.0 U	2.8	29.4 U	5.13	91.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-008-GW1	227	9.2	112	<0.05	<0.005

LEGEND

TP1 - Composite of subsamples TP1A and 1B.  
BACKGROUND - From the Kalamazoo River (04-010-081).

GW1 - Downgradient (northwest) of tailings. WE-16 monitoring well.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>East Pacific</u>	County: <u>Broadwater</u>
Legal Description: <u>T 8N R 1W</u>	Section(s): <u>Sec. 26 and Sec. 27</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Zn, Cu</u>
Latitude: <u>N 46° 25.1'</u>	Primary Drainage: <u>Weasel Creek</u>
Longitude: <u>W 111° 42.2'</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Spring Gulch</u>
Quad: <u>Winston</u>	Date Investigated: <u>July 27 and 28, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>04-008</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 1,450 cubic yards of uncovered tailings on site. The following were elevated at least three times background:

Arsenic: 458J mg/kg	Cadmium: 32 mg/kg
Cobalt: 11.5J mg/kg	Chromium: 35J mg/kg
Copper: 399J mg/kg	Iron: 31,600 mg/kg
Mercury: 0.256J mg/kg	Manganese: 2,510J mg/kg
Nickel: 33J mg/kg	Lead: 4,760 mg/kg
Antimony 33J mg/kg	Zinc: 5,550 J mg/kg
  
- There were approximately 74,900 cubic yards of mostly uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 575J mg/kg	Cadmium: 36 to 53 mg/kg
Cobalt: 11.4J to 20.2J mg/kg	Chromium: 11J to 95J mg/kg
Copper: 213J to 980J mg/kg	Iron: 32,700 to 42,100 mg/kg,
Mercury: 0.325J to 0.789J mg/kg	Manganese: 1,620 to 1,710J mg/kg
Nickel: 13J to 101J mg/kg	Lead: 4,000 to 6,160 mg/kg
Antimony: 18J to 116J mg/kg	Zinc: 4,650J to 8,240J mg/kg
  
- There were two discharging adits identified at the site. The adit associated with WR-4 was sampled (SW-3); the pH measurement was 8.02. The discharge did not enter the creek via a surface route. The MCL/ MCLG for cadmium and acute and chronic aquatic life criteria for zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury was exceeded in the adit discharge.
  
- There were tailings in Spring Creek. Observed releases to Spring Creek were documented for arsenic, cadmium, iron, manganese, lead, and zinc. The MCL for cadmium was exceeded in the downstream sample, and acute and chronic aquatic life criteria were exceeded for cadmium and zinc in the downstream sample. These exceedances were directly attributable to the site.

East Pacific PA# 04-008  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/27/83

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils		Results per dry weight basis												
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-008-SE-1	30 J	124	1.1 U	13.5 J	36 J	88.3 J	27400	0.173 J	763 J	24 J	49	13 UJ	133 J	0.58 U
04-008-SE-2	365 J	73.3	31	13.6 J	40 J	347 J	27200	0.227 J	2350 J	32 J	2690	42 J	6120 J	0.298 U
04-008-TP-1	458 J	64.2	32	11.5 J	35 J	399 J	31600	0.256 J	2510 J	33 J	4760	33 J	5550 J	0.283 U
04-008-WR-1	575 J	107	48	20.2 J	95 J	980 J	42100	0.608 J	1620 J	101 J	6160	116 J	8240 J	NR
04-008-WR-2	236 J	56.9	53	13.5 J	33 J	475 J	38600	0.789 J	1710 J	28 J	4250	34 J	6950 J	NR
04-008-WR-3	214 J	65.3	36	11.4 J	11 J	213 J	32700	0.325 J	1680 J	13 J	4000	18 J	4650 J	NR
BACKGROUND	85	63.2	0.7	1.9 U	1.9	11.6	9000	0.011 J	470	3 U	77	6 UJ	74	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Reported

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR				SULFUR				PYRITIC SULFUR				ORGANIC SULFUR				PYRITIC SULFUR				SULFUR			
	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %	TOTAL %	SULFUR ACID BASE %	NEUTRAL POTENT. %	ACID BASE POTENT. %
04-008-TP1-DUP	0.86	26.9	73.3	46.5	<0.01	0.56	0.53	0.05	0.34	17.5	55.8	55.8	0.34	17.5	55.8	55.8	0.34	17.5	55.8	55.8	0.34	17.5	55.8	55.8
04-008-TP-1	0.88	27.5	73.3	45.8	<0.01	0.53	0.53	0.05	0.35	16.6	56.8	56.8	0.35	16.6	56.8	56.8	0.35	16.6	56.8	56.8	0.35	16.6	56.8	56.8
04-008-WR-1	0.58	18.1	22.3	4.16	0.22	0.05	0.05	0.15	0.31	1.56	20.7	20.7	0.31	1.56	20.7	20.7	0.31	1.56	20.7	20.7	0.31	1.56	20.7	20.7
04-008-WR-2	3.42	107	93.0	-13.9	0.60	1.22	1.22	0.60	1.22	38.1	54.9	54.9	1.22	38.1	54.9	54.9	1.22	38.1	54.9	54.9	1.22	38.1	54.9	54.9
04-008-WR-3	3.00	93.7	86.7	-7.02	0.42	1.43	1.43	0.42	1.15	44.7	42.0	42.0	1.15	44.7	42.0	42.0	1.15	44.7	42.0	42.0	1.15	44.7	42.0	42.0

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	Metals in Water												HARDNESS	
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC. (mg CaCO3/L)
04-008-SW-1	1.69 U	3.9	2.57 U	9.7 U	6.83 U	3.6 J	25.3 J	0.12	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	30.5
04-008-SW-2	9.59	10.9	12.8	9.7 U	6.83 U	10.7 J	191 J	0.11	33.9	12.7 U	72.6	30.7 U	939 JX	102
04-008-SW-3	6.35	4.6	8.9	9.7 U	6.83 U	4.9 J	16.1 J	0.12	5.57	12.7 U	2.88	30.7 U	774 JX	196

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID.	TOTAL DISSOLVED SOLIDS				CHLORIDE				SULFATE				NO3/NO2-N				CYANIDE			
04-008-SW-1	97	<	5.0	12	<	0.1	<	0.01												
04-008-SW-2	201	<	5.0	72	<	0.21	<	0.01												
04-008-SW-3	320	<	5.0	139	<	0.4	<	NR												

LEGEND

- SE1 - 100 feet upgradient of waste rock dump 3 in Spring Creek.  
SE2 - 100 feet downgradient of tailings in Spring Creek.  
TP1 - Composite of subsamples TP-1A-A, B, C, TP1B-B, and A.  
WR1 - Composite of subsamples WR1A, B, C, WR2A, B, and C.  
WR2 - Composite of subsamples WR3A and 3B.  
WR3 - Composite of subsamples WR4A, B, WR5A, B, and C.  
BACKGROUND - From Voeburg (04-014-SS1).  
TP1-DUP - Duplicates of 04-008-TP-1.
- SW1 - Same as SE1.  
SW2 - Same as SE2.  
SW3 - Add discharge at waste rock dump 4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Kleinschmidt</u>	County: <u>Broadwater</u>
Legal Description: T <u>7N</u> R <u>1W</u>	Section(s): <u>SW 1/4, NE 1/4, Section 3</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Au, Pb, Zn, Ag</u>
Latitude: <u>N 46° 23' 25"</u>	Primary Drainage: <u>Missouri River</u>
Longitude: <u>W 111° 42' 45"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Whitehorse Creek</u>
Quad: <u>Winston</u>	Date Investigated: <u>July 21, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>04-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 1,210 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 111 mg/kg	Manganese: 3,030 mg/kg
Arsenic: 8,030 mg/kg	Lead: 12,100 mg/kg
Cadmium: 8.8 mg/kg	Antimony: 56.9J mg/kg
Copper: 335JX mg/kg	Zinc: 1,480JX mg/kg
Mercury: 0.66J mg/kg	
- The volume of waste rock observed at the site was estimated to be 8,685 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 28.5 to 61.2 mg/kg	Arsenic: 1,760 to 4,180 mg/kg
Cadmium: 2.9 mg/kg	Mercury: 0.18J to 0.75J mg/kg
Lead: 5,070 to 6,840 mg/kg	Zinc: 421JX to 534JX mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Whitehorse Creek flows adjacent to the site on the south side. Observed releases to Whitehorse Creek were documented for silver, arsenic, copper, lead, and zinc. The MCL for arsenic and the EPA action level for lead were exceeded in the downstream sample. Additionally, the acute and chronic aquatic life criteria for copper, lead, and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included several collapsing wooden structures (loadout and cabins) and several, relatively small, open pits and trenches.

Kleinschmidt PA# 04-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 07/21/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-010-SE1	49.3	3960	119	5.8	3.0	4.0 JX	147 JX	39200	0.19 J	2510	4.0 UJX	4790	27.3 J	776 JX	NR
04-010-SE2	1.1 U	26.5	34.7	1.0 U	2.1 U	2.1 JX	14.2 JX	6500	0.03 J	191	4.3 JX	42.4	12.6 UJ	222 JX	NR
04-010-WR1	28.5	1760	57.3	2.9	1.7	1.7 JX	88.2 JX	30800	0.75 J	1570	2.3 UJX	5070	8.2 UJ	421 JX	NR
04-010-WR2	61.2	4180	58.2	2.9	2.5	1.3 UJX	123 JX	53100	0.18 J	1400	2.8 UJX	6840	10.2 UJ	534 JX	NR
04-010-WR3	111.0	8030	68.3	8.8	1.7 U	2.7 JX	335 JX	67100	0.86 J	3030	3.0 UJX	12100	56.9 J	1480 JX	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
04-010-WR1	1.32	41.2	1.44	-40	1.13	-40	1.13	0.01	0.01	0.18	0.31	1.13	16.9	0.16	0.14	-25.9
04-010-WR2	3.60	112	-9.03	-121	2.01	-121	0.54	0.54	0.18	1.05	0.31	16.9	0.16	0.14	-25.9	-25.9

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-010-SW1	3.1	88.7 J	24.1	4.0 U	8.4 U	6.8 U	19.2	3740	0.16	314	14.4 U	122 J	51.6 U	114	37.3
04-010-SW2	0.12 U	7.5 J	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	316	0.14	37.9	14.4 U	3.9 J	51.6 U	25.1	29.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-010-SW1	59	<5	5	0.11	NR
04-010-SW2	59	<5	<5	0.21	NR

LEGEND

- SE1 - Approx. 30' downgradient of WR2 after last batch of large diesel tank.  
SE2 - 20' downgradient of spring that enters White Horse Creek; 150' south of WR3.  
WR1 - Composite of subsamples WR1A through 1C, and 2A and 2B.  
WR2 - Composite of subsamples WR2A through 3C.  
WR3 - Composite of subsamples WR3A, 4B, and 4C.  
BACKGROUND - From the Kleinschmidt Meter (04-010-SB1).
- SW1 - Same as sample 04-010-SE1.  
SW2 - Same as sample 04-010-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Vosburg</u>	County: <u>Broadwater</u>
Legal Description: <u>T 8N R 1W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 34</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Au.Pb. Ag. Zn</u>
Latitude: <u>N 46° 23' 58"</u>	Primary Drainage: <u>Beaver Creek</u>
Longitude: <u>W 111° 43' 11"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Badger Creek</u>
Quad: <u>Winston</u>	Date Investigated: <u>July 27, 1993</u>
Inspectors: <u>Babits, Lasher, Flammang</u>	P.A. # <u>04-014</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 42,000 cubic yards of tailings at the site. The majority of the tailings were uncovered. The following were elevated three times background:

Arsenic: 13,100 mg/kg	Cadmium: 7.8 mg/kg
Cobalt: 6.2 mg/kg	Chromium: 16.6 mg/kg
Copper: 780 mg/kg	Iron: 78,600 mg/kg
Mercury: 0.256J mg/kg	Manganese: 2,080 mg/kg
Lead: 4,640 mg/kg	Antimony: 12 mg/kg
Zinc: 564 mg/kg	Cyanide: 8.38 mg/kg
  
- There were approximately 29,850 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 204 to 3,990 mg/kg	Cadmium: 5.9 to 8.4 mg/kg
Cobalt: 7.9 mg/kg	Copper: 38.2 to 379 mg/kg
Iron: 30,500 to 32,800 mg/kg	Mercury: 1.41J to 1.64J mg/kg
Manganese: 2,030 to 3,860 mg/kg	Lead: 729 to 737 mg/kg
Zinc: 318 to 596 mg/kg	
  
- Neither of the two discharging adits had a surface route to water. A sample was collected from the discharge associated with WR-5 (SW-5). The MCL for arsenic and the chronic aquatic life criteria for arsenic, mercury, and lead were exceeded in the adit discharge.
  
- There were tailings in Badger Creek. Observed releases to Badger Creek were documented for arsenic, copper, iron, manganese, lead, and zinc. The MCL for arsenic was exceeded in downstream sample, as were the acute and chronic aquatic life criteria for copper and lead. Additionally, the chronic aquatic life criteria for iron was exceeded in the downstream sample. These exceedances were directly attributable to the site.

Vosburg PA# 04-014  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/27/93

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-014-SE-1	60	65.3	1.3	3.7	7.4	17.5	10400	0.038 J	392	5 J	47	8 UJ	87	0.436 U
04-014-SE-2	8860	78.8	5.4	3.4	10.3	564	54400	0.102 J	1600	3 U	3590	13 J	332	1.1
04-014-TP-1	13100	95	7.8	6.2	16.6	780	78600	0.256 J	2080	4 J	4640	12 J	564	8.38
04-014-WR-1	2030	131	8.4	7.9	1.5	273	30500	1.64 J	3860	3 U	737	6 UJ	596	NR
04-014-WR-2	204	33.1	0.6	2.4	1.3 U	38.2	8670	1.41 J	598	2 U	86	6 UJ	63	NR
04-014-WR-3	3990	175	5.9	5.6	1.3 U	379	32800	1.56 J	2030	2 U	729	6 UJ	318	NR
BACKGROUND	85	63.2	0.7	1.9 U	1.9	11.6	9000	0.011 J	470	3 U	77	6 UJ	74	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL. POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000
04-014-TP-1	0.35	10.9	15.8	4.89	0.02	<0.01	0.00	15.8
04-014-WR-1	0.04	1.25	6.97	5.72	0.01	<0.01	0.00	6.97
04-014-WR-2	0.04	1.25	12.8	11.6	0.03	<0.01	0.00	12.8
04-014-WR-3	0.65	20.3	6.38	-13.9	0.15	0.09	2.81	3.57

WATER MATRIX ANALYSES

Results in ug/L

Metals in Water

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CAL.C. (mg CaCO3/L)
04-014-SW-1	2.67	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	123	0.038 U	4.08 U	12.7 U	4.64	30.7 U	7.57 U	21.5
04-014-SW-2	295	4.67	2.57 U	9.7 U	6.83 U	14.9	1300	0.038	61.6 J	12.7 U	35.3	30.7 U	27.1	25.5
04-014-SW-5	268	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	409	0.087	5.5 J	12.7 U	2.95	30.7 U	7.57 U	43

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-014-SW-1	108	< 5.0	6	< 0.05	< 0.01
04-014-SW-2	127	< 5.0	8	< 0.05	< 0.01
04-014-SW-5	122	< 5.0	12	1.3	NR

LEGEND

- SE1 - 100 feet upgradient of tailings in Badger Creek.  
SE2 - At PPE of edit discharge and tailings in Badger Creek.  
TP1 - Composite of subsamples TP1A, 1B, and TP2A-A.  
WR1 - Composite of subsamples WR1, 2A, and 2B.  
WR2 - Composite of subsamples WR2A and B.  
WR3 - Composite of subsamples WR3A, 4B, 5A, 5B, 5C, and 5D.  
BACKGROUND - From Vosburg (04-014-SB1).
- SW1 - Same as SE1.  
SW2 - Same as SE2.  
SW5 - Add discharge of waste rock dump 5.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Golden Age</u>	County: <u>Broadwater</u>
Legal Description: T <u>8N</u> R <u>1W</u>	Section(s): <u>SW 1/4, SE 1/4, Section 34</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Au, Pb, Zn, Ag</u>
Latitude: <u>N 46° 24' 05"</u>	Primary Drainage: <u>Beaver Creek</u>
Longitude: <u>W 111° 42' 42"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Weasel Creek</u>
Quad: <u>Winston</u>	Date Investigated: <u>July 21, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>04-050</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 8,995 cubic yards. The following were elevated to at least three times the background concentrations:

Silver: 15.6 to 17 mg/kg	Arsenic: 1,410 to 11,000 mg/kg
Cadmium: 6.3 mg/kg	Copper: 180JX mg/kg
Mercury: 1.47J mg/kg	Lead: 756 to 2,790 mg/kg
Zinc: 945JX mg/kg	
- Three discharging adits were observed at the site. The MCL for arsenic and the chronic aquatic life criteria for mercury and lead were exceeded in the Adit #1 discharge. The chronic aquatic life criteria for mercury was exceeded in the Adit #2 discharge.
- The flows from two of the discharging adits at the site (Adit #2 and Adit #3) combined to form the headwaters of Weasel Creek. No MCLs were exceeded in Weasel Creek; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury and lead were exceeded.
- Potential safety hazards observed at the site included two open adits, a 15-foot highwall, and a 20-foot-deep open pit.

Golden Age PA# 04-050  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 07/21/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-050-SE1	12.0	1690	32.7	13.9	4.4	1.6 UJX	219 JX	30200	0.08 J	8440	3.3 UJX	12400	11.7 UJ	1730 JX	NR
04-050-WR1	17.0	1410	60.6	6.3	1.6	1.2 UJX	51.7 JX	23400	0.14 J	1870	2.6 UJX	2790	9.2 UJ	945 JX	NR
04-050-WR2	15.6	11000	42.7	1.0	3.7	1.1 UJX	180 JX	59800	1.47 J	1850	2.3 UJX	756	8.3 UJ	77.4 JX	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
04-050-WR1	1.77	55.3	24.0	-31	1.17	0.78	0.23	0.38	0.23	0.22	0.08	0.08	0.38	0.23	0.22	0.08	0.08	17.4
04-050-WR2	1.09	34.1	-2.95	-37.0	0.78	0.23	0.23	0.23	0.23	0.08	0.08	0.08	0.23	0.23	0.23	0.23	0.23	-5.44

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-050-AD1	0.12 U	72.7 J	10.8	4.0 U	8.4 U	6.8 U	5.9 U	233	0.14	26.7	14.4 U	1.9	51.6 U	15.6 U	50.8
04-050-AD2	0.12 U	13.4 J	11.7	4.0 U	8.4 U	6.8 U	5.9 U	92.8	0.14	12.6	14.4 U	0.4	51.6 U	54.4	115
04-050-SW1	0.12 U	13.7 J	9.0	4.0 U	8.4 U	6.8 U	5.9 U	50.2	0.14	7.4	14.4 U	2.9	51.6 U	178	88.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-050-AD1	124	<5	16	1.38	NR
04-050-AD2	182	<5	32	0.39	NR
04-050-SW1	160	<5	34	0.74	NR

LEGEND

SEI - Designation of WRI.  
WRI - Composite of subsamples WRI1 through ID.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From the Kleinfeld Mine (04-010-881).  
ADI - Discharge from Adit #2A.  
AD2 - Discharge from Adit #1, where it flows from a 6" pipe.  
SW1 - Same as sample 04-050-SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Sunrise/January</u>	County: <u>Broadwater</u>
Legal Description: T <u>8N</u> R <u>1W</u>	Section(s): <u>S 1/2, SW 1/4, Section 26</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Cu, Pb, Zn, Ag, Au</u>
Latitude: <u>N 46° 24' 55"</u>	Primary Drainage: <u>Beaver Creek</u>
Longitude: <u>W 111° 41' 48"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Weasel Creek</u>
Quad: <u>Winston</u>	Date Investigated: <u>August 5, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>04-130 &amp; 04-126</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 11,030 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 63.9J to 70.7J mg/kg	Mercury: 0.21J to 0.63J mg/kg
Arsenic: 402 to 905 mg/kg	Lead: 10,400 to 15,900 mg/kg
Cadmium: 8.8 to 24.8 mg/kg	Antimony: 42.8J mg/kg
Chromium: 17.9 mg/kg	Zinc: 1,600 to 4,070 mg/kg
Copper: 489 to 515 mg/kg	
- Two discharging adits were associated with the site; both flows discharge to Weasel Creek. The MCLs for cadmium and antimony and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the Adit #1 discharge. Additionally, the chronic aquatic life criteria for copper and mercury were exceeded in the Adit #1 discharge. Only the chronic aquatic life criteria for mercury was exceeded in the Adit #2 discharge.
- Weasel Creek flows through the center of the site. An observed release to Weasel Creek was documented for zinc. The MCL for cadmium, as well as the acute and chronic aquatic life criteria, were exceeded in the downstream sample. These exceedances were directly attributable to the site. The acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site.
- Potential safety hazards observed at the site included one small mine opening, a 30-foot highwall, and several collapsing structures.

# SOLID MATRIX ANALYSES

## Metals in soils Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-130-SE1	3.5 J	361	77.7	16.8	7.0	4.2	145	24500	0.09 J	761	3.7 U	860	13.4 UJ	2170	NR
04-130-SE2	1.8 J	312	63.0	7.3	7.1	5.1	130	23300	0.03 J	624	3.0 U	321	10.8 UJ	797	NR
04-130-WR1	63.9 J	905	168	8.8	3.8	1.2 U	489	39600	0.63 J	371	2.6 U	10400	28.2 J	1600	NR
04-130-WR2	70.7 J	614	64.0	24.8	6.1	17.9	515	32200	0.21 J	1020	5.0	15900	42.8 J	4070	NR
04-130-WR3	0.8 UJ	402	47.1	1.5	11.5	4.9	95.7	43100	0.03 J	1590	6.3	83.5	9.9 UJ	162	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	28.2	10.2 UJ	64.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

## Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	%	1/1000	%	1/1000	POTENT.	1/1000	ACID BASE	POTENT.	%	1/1000	%	1/1000	%	1/1000	%	1/1000	ACID BASE	POTENT.	%	1/1000
04-130-WR1	1.93	60.3	-1.98	-82	1.89	0.07	0.17	2.19	-4.17											
04-130-WR2	0.99	30.9	4.71	-28	0.72	0.16	0.11	5.00	-0.29											
04-130-WR3	1.25	39.0	58.3	19.3	0.39	0.67	0.19	20.9	37.4											

# WATER MATRIX ANALYSES

## Metals in Water Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
04-130-AD1	0.12 U	1.1 U	9.6	128	8.4 U	6.8 U	106	117	0.16 JX	5210	20.6	0.4	54.3	26000	838
04-130-AD2	0.12 U	29.0	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	572	0.17 JX	30.4	14.4 U	0.4 U	51.6 U	23.3	212
04-130-SW1	0.12 U	16.5	7.2	10.7	8.4 U	6.8 U	5.9 U	138	0.13 JX	39.4	15.5	4.6	51.6 U	1060	119
04-130-SW2	0.12 U	18.6	5.5	4.0 U	8.4 U	6.8 U	5.9 U	119	0.16 JX	10.4	14.4 U	3.1	51.6 U	217	90.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

## Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
04-130-AD1	981	<5.0	699	<0.05	NR
04-130-AD2	244	<5.0	83	0.61	NR
04-130-SW1	170	<5.0	62	0.47	NR
04-130-SW2	72	<5.0	37	0.56	NR

## LEGEND

SE1 - 10' below bed with, before when lowest step caused in.  
SE2 - 15' upstream of WEL.  
WEL - Composite of subsamples WEL1 and WEL2.  
WEL1 - Composite of subsamples WEL1A and WEL1B.  
WEL2 - Composite of subsamples WEL2A through WEL2C and WEL2D.  
WEL3 - Composite of WEL3A, WEL3B, WEL3C, and WEL3D.  
BACKGROUND - From the Kalamazoo River (04-130-SE1).

AD1 - Discharge from left bank of WEL1.  
AD2 - Discharge from left bank of WEL2.  
SW1 - Same as sample 04-130-SE1.  
SW2 - Same as sample 04-130-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Chartam</u>	County: <u>Broadwater</u>
Legal Description: T <u>8N</u> R <u>1W</u>	Section(s): <u>Sections 13 and 24</u>
Mining District: <u>Winston</u>	Mine Type: <u>Hardrock/Ag. Au</u>
Latitude: <u>N 46° 26' 52"</u>	Primary Drainage: <u>Missouri River</u>
Longitude: <u>W 111° 39' 45"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Iron Age Gulch</u>
Quad: <u>Winston</u>	Date Investigated: <u>June 22, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>04-501</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 10,690 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 3.8 to 23 mg/kg	Arsenic: 1,740 to 10,300 mg/kg
Cadmium: 48.0J to 55.0J mg/kg	Copper: 169 to 515 mg/kg
Mercury: 0.34JX to 2.12JX mg/kg	Manganese: 4,580 mg/kg
Lead: 109 to 8,070 mg/kg	Zinc: 3,030J to 7,630J mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Miller Gulch flowed directly through the center of the site. An observed release to Miller Gulch was documented for mercury. Also, the MCL for mercury and the acute and chronic aquatic life criteria for mercury were exceeded in the downstream sample. These exceedences were directly attributable to the site.
- Potential safety hazards observed at the site included one open adit and a large, open pit.

Chartam PA# 04-501  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/22/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
04-501-SE1	1.2	8.2	83.8 J	1.4	9.7	12.5 J	29.1	25600	0.03 U	397 J	8.9	42.6	7.0 U	201	NR
04-501-SE2	13.5	4880	117 J	49.1	17.0	13.3 J	308	52100	0.14	1940 J	10.0	3770	16.0	7930	NR
04-501-WR1	3.8	217	32.0	1.0 J	1.2 U	0.6 U	47.8	14200	2.12 JX	66.5	1.1 U	109	4.0 UJ	190 J	NR
04-501-WR2	4.8	1740	29.5	55.0 J	13.6	8.2	169	35700	0.14 JX	4590	10.9	1440	19.0 J	7630 J	NR
04-501-WR3	23	10300	71.1	48.0 J	12.5	9.2	515	72000	0.34 JX	1120	2.6	8070	12.9 J	3030 J	NR
BACKGROUND	0.8 U	98.6	130	0.8 U	11.8	5.9 JX	49.1 JX	24600	0.05 J	947	3.8 JX	29.2	10.2 UJ	84.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		SULFATE %		PYRITIC SULFUR %		ORGANIC SULFUR %		PYRITIC SULFUR ACID BASE POTENT	
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000
04-501-WR1	0.34	10.6	-2.59	-13	0.32	-13	0.01	0.01	0.01	0.01	0.01	0.01	0.31	-2.90
04-501-WR2	2.04	63.7	21.3	-42	1.06	0.78	0.2	24.4	0.2	24.4	0.28	17.2	-3.05	-16.0
04-501-WR3	2.03	63.4	1.20	-82	1.20	0.55	0.28	17.2	0.55	0.28	17.2	-16.0		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
04-501-SW1	0.16	4.6	58.0	2.6 U	8.7 U	4.7 UX	11.2	2680	0.11 U	113	8.0 U	238 J	29.4 U	74.4	135
04-501-SW2	0.12 U	8.3	36.3	2.6 U	8.7 U	5.0 JX	4.8 U	14.2	5.48	4.4 U	8.0 U	2.3	29.4 U	9.9	295

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
04-501-SW1	175	5.2	30	0.44	NR
04-501-SW2	396	<5.0	167	0.65	NR

LEGEND

- SE1 - Upstream in Miller Gulch.  
SE2 - Downstream in Iron Age Gulch after confluence with Miller Gulch.  
WR1 - Grab sample of the WR1 subsample.  
WR2 - Composite of subsamples WR2A and 2B.  
WR3 - Grab sample of the WR3 subsample.  
BACKGROUND - From the Elkhornville Mine (04-010-081).
- SW1 - Same as sample 04-501-SE1.  
SW2 - Same as sample 04-501-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Block "P" Tailings</u>	County: <u>Cascade</u>
Legal Description: <u>T 15N R 8E</u>	Section(s): <u>SE 1/4, Sec. 16</u>
Mining District: <u>Barker/Hughesville</u>	Mine Type: <u>Mill Tailings</u>
Latitude: <u>47° 03' 20"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>110° 38' 56"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 7, 1993</u>
Inspectors: <u>Bullock, Babits, Flammang, Lasher, Clark / Pierson</u>	P.A. # <u>07-090</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- The total volume of mill tailings associated with this site was estimated at 625,000 cubic yards, contained in two impoundments (upper and lower). The following elements were elevated at least three times background in previous investigations:

Arsenic: 520 to 2,140 mg/kg	Cadmium: 13.0 to 68.0 mg/kg
Copper: 254 to 688 mg/kg	Iron: 44,200 to 141,000 mg/kg
Mercury: 0.35 to 1.00 mg/kg	Lead: 4,000 to 10,600 mg/kg
- The tailings were poorly contained, and were actively eroding into Galena Creek. The tailings had a very low pH (1.81), were unvegetated, and had large erosion channels cut through them. An additional 10,000 cubic yards of tailing materials were observed in large stream side deposits downstream in Dry Fork Belt Creek.
- No waste rock or flowing adits were associated with this site.
- Surface water samples were collected during the 1993 investigation. Observed releases to surface water were documented for Arsenic in water, and mercury in sediment samples. Drinking water standards (MCL's) were exceeded for arsenic, cadmium, lead, and antimony; acute aquatic life criteria exceedances for cadmium, copper, and zinc were also documented. Upstream samples exceeded MCL's for cadmium, antimony, and lead, and acute aquatic life criteria for cadmium, copper, and zinc; the Hughesville mining district was upstream from the site and contributed to the observed upstream water quality degradation.
- Monitoring wells, sampled previously, indicated that MCL's were exceeded for cadmium, copper, nickel, and lead. These samples also documented an observed release to groundwater for cadmium, copper, iron, and lead. manganese, zinc, and nickel concentrations were very elevated in the downgradient well.
- No hazardous structures or openings were observed at the site.

Block P. Tailings PA# 07-090  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-090-SE-1	396	486	9.4 J	7.7 J	8.5	182 J	51700	0.147 J	3120 J	25 J	705	5 U	1590 J	NR
07-090-SE-2	140	97.3	13.2 J	7 J	3.9	149 J	21600	0.037 J	2720 J	18 J	1070	3 U	2080 J	0.31 U
07-090-SE-3	196	123	11.1 J	7.6 J	2.8	149 J	26700	0.045 J	4030 J	23 J	1110	4 U	1970 J	0.57

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
07-090-SW-1	9.92	40.7	2.9	5.99 U	5 U	23.5	1390	0.038 U	790	8.78 U	6.75	36.9	632	66.2
07-090-SW-2	54.5	45.4	16.3	5.99 U	5 U	121	6040	0.038 U	3890	19.1	38.7	33	3670	105
07-090-SW-3	16.8	45.2	15.5	5.99 U	5 U	100	4360	0.038 U	3640	18.8	39	33.5	3440	97.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-090-SW-1	72	< 5.0	23	< 0.05	NR
07-090-SW-2	190	< 5.0	106	< 0.05	0.02
07-090-SW-3	146	< 5.0	87	< 0.05	0.01

LEGEND

SE1 - In Dry Fork Belt Creek below confluence with Galena Creek  
SE2 - Before confluence with Dry Fork Belt Creek in Galena Creek, approx. 425'  
SE3 - Upgradient of Block P. Tailings below confluence with Gold Rush Creek  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bon Ton</u>	County: <u>Cascade</u>
Legal Description: <u>T 15N R 8E</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 1</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag. Pb, Zn</u>
Latitude: <u>N 47° 04' 58"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 52"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>McKay Gulch</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 3, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>07-094</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of material tentatively identified as tailings associated with this site was estimated to be approximately 1,200 cubic yards; however, no elements were elevated more than three times background (based on XRF analytical data). Lead and zinc were moderately elevated above background concentrations.
- The volume of waste rock associated with this site was estimated to be approximately 3,300 mg/kg. The following elements were elevated at least three times background:  
Arsenic: 523J to 1,330J mg/kg      Manganese: 41,100 mg/kg  
Cadmium: 187 mg/kg      Lead: 9,140 to 12,300 mg/kg  
Iron: 109,000 mg/kg      Antimony: 61.8J mg/kg  
Mercury: 0.556 mg/kg      Zinc: 50,900 mg/kg
- One discharging adit was identified at the site during the investigation. MCLs were exceeded for cadmium and antimony in the adit discharge. The acute aquatic life criteria for zinc was exceeded in the adit discharge. The chronic aquatic life criteria for iron, cadmium, and zinc were also exceeded. The pH measurement in the adit discharge was 6.10 and the specific conductance was 980 umhos/cm.
- The intermittent McKay Gulch was flowing directly through the site (through the waste rock dumps in places). Observed releases to McKay Gulch were documented for arsenic, cadmium, iron, manganese, lead, and zinc. The MCL for cadmium was exceeded in the downstream McKay Gulch sample. Acute and chronic aquatic life criteria for zinc were exceeded in the downstream sample; also, chronic aquatic life criteria for iron, cadmium, and lead were exceeded in the downstream sample. No MCLs or aquatic life criteria were exceeded in the upstream sample. All MCL and aquatic life criteria exceedances in McKay Gulch were directly attributable to the site.
- Stream erosion created potentially hazardous (unstable) slopes on WR-1 and WR-3.
- The remains of a wooden building on site was classified a hazardous structure.

**Bon Ton PA# 07-094**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/03/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-094-CONC	587 J	127 J	90.2	28.3	13.1 J	25.6 J	41100	0.132	156000	701	2610	98.5 J	93000	NR
07-094-SE-1	51.9 J	75.7 J	2.6	6.87	16.9 J	16.1 J	15600	0.035	959	25.1	335	5.17 UJ	945	NR
07-094-SE-2	219 J	179 J	60.3	4.23	10.3 J	40.5 J	33400	0.105	30700	166	287	25.2 J	21500	NR
07-094-WR-1	523 J	67.3 J	13.5	1.28 U	3.29 J	42.1 J	61700	0.556	11300	51.5	9140	9.24 J	3860	NR
07-094-WR-2	1330 J	36.8 J	187.0	3.27	8.98 J	39.3 J	109000	0.159	41100	175	12300	61.8 J	50900	NR
BACKGROUND	122 J	441 J	5	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
07-094-WR-1	9.4	294	143	-151	3.79	5.32	166	-23.1
07-094-WR-2	23.9	747	182	-565	3.99	9.58	299	-117

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
07-094-GW-1	33.9	11.5	20.1	5.99 U	5 U	4.4 J	7060	0.038 U	7920	54.9	10.2	26.6	13000 JX	609
07-094-SW-1	1.41	26.8	2.55 U	5.99 U	5 U	5.27 J	35.9	0.038 U	9.9	12.1	4.12	18.3 U	24.7 JX	202
07-094-SW-2	14.1	16	8.27	6.17	5 U	11.2 J	2870	0.038 U	2090	18.9	16.6	18.3 U	3340 JX	359

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-094-GW-1	764	< 5.0	353	< 0.05	NR
07-094-SW-1	221	< 5.0	7	< 0.05	NR
07-094-SW-2	427	< 5.0	161	< 0.05	NR

**LEGEND**

CONC - Small concentrate pile Northeast of mill building  
 SE1 - Approx. 25' upstream from waste rock dump 3.  
 SE2 - Downgradient of alleged tailings, approx. 10'.  
 WR1 - Composite of subsamples WR1A and 1B.  
 WR2 - Composite of subsamples WR2A and 2B.  
 BACKGROUND - From the Bon Ton Mine (07-094-SS-1).

GW1 - Discharge from a collapsed adit.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Broadwater</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>NE 1/4, SE 1/4, Section 32</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 56' 03"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 27"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Belt Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 12, 1994</u>
Inspectors: <u>Tuesday, Bisch, West</u>	P.A. # <u>07-079</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 41,200 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 34.8JX to 92.8JX mg/kg	Arsenic: 174J to 224J mg/kg
Barium: 599 to 683 mg/kg	Cadmium: 25.8 to 28.7 mg/kg
Copper: 58.1 to 105 mg/kg	Mercury: 0.52J to 1.09J mg/kg
Manganese: 8,700 to 10,600 mg/kg	Nickel: 45.6 mg/kg
Lead: 4,380 to 7,420 mg/kg	Antimony: 14.3J to 23.3J mg/kg
Zinc: 5,360 to 5,710 mg/kg	
- One discharging adit was observed at the site during the investigation. The discharge flowed a short distance over a waste rock dump and eventually seeped into the dump. The MCLs for cadmium and antimony and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the adit discharge.
- A surface water sample was collected from a flowing stream that emanated at the foot of the mine's lowermost waste rock dump. The MCL for cadmium and the acute and chronic aquatic life criteria for zinc were exceeded in the stream. Additionally, the chronic aquatic life criteria for cadmium was exceeded in the stream.
- Potential safety hazards observed at the site included an open adit with an unsecured chain-link fence placed at the entrance and two collapsing wooden loadout structures.

Broadwater PA# 07-079  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/12/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-079-WR1	92.8 JX	224 J	599	28.7	13.4	10.8	105	28300	0.52 J	8700	14.8	7420	23.3 J	5710	NR
07-079-WR2	34.8 JX	174 J	683	25.8	27.0	38.0	58.1	42600	1.09 J	10600	45.8	4380	14.3 J	5360	NR
BACKGROUND	0.5 B	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		SULFUR		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	POTENT.	SULFATE	SULFUR	ACID BASE	POTENT.	ACID BASE	POTENT.
	%	1/1000	1/1000	1/1000	%	%	1/1000	1/1000	1/1000	1/1000
07-079-WR1	0.93	29.1	11.7	-17	0.36	0.07	0.48	2.19	9.53	
07-079-WR2	0.62	19.4	30.0	10.6	0.20	0.12	0.30	3.75	26.2	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-079-AD1	0.12 U	1.9 B	2.8 B	20.2 J	8.7 U	4.7 U	4.8 U	99.9 B	0.08 U	3030	99.4	3.1	46.0 B	15400	489
07-079-SW1	0.12 U	1.5 B	30.5 B	14.5 J	8.7 U	4.7 U	4.6 U	128	0.08 U	48.7	13.6 B	15.5	29.4 U	4830	376

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-079-AD1	690	<5	472	<0.05	NR
07-079-SW1	521	<5	322	<0.05	NR

LEGEND

WEL - Composite of subsamples WEL1A through 1G.  
WR2 - Composite of subsamples WR2A through 2C.  
BACKGROUND - From the Blythe Mine (07-161-581).

AD1 - Discharge from lower sill on WR2.  
SW1 - Downstream of active dam in unexcavated discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Vilipa</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 16</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Au, Pb, Zn, Cu</u>
Latitude: <u>N 46° 58' 31"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 40"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>McKay Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 29, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>07-080</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 5,700 cubic yards. The following elements were elevated at least three times background:  
Copper: 108J to 151J mg/kg      Mercury: 0.397J to 0.917 mg/kg
- One minor adit discharge, two shafts with small amounts of accumulated precipitation, and one small seep at the toe of a waste rock dump were identified as groundwater features at the site during the investigation; however, none of these water sources were sampled. Instead, an additional sample was collected from McKay Creek (in the central section of the site) to assess potential impacts.
- McKay Creek flowed directly through the site (WR-4 was actively eroding into McKay Creek); surface water samples were collected upstream, near the center of the site, and downstream from the site. An observed release to McKay creek was documented for copper. No MCLs were exceeded in any of the samples. The acute aquatic life criteria exceedance for copper was directly attributable to the site. Downstream sediment samples indicated elevated concentrations (greater than three times upstream) of copper, mercury, and manganese.
- Four potentially hazardous mine openings were identified at the site including three open but partially collapsed shafts and one open adit. One of the cabins located on site was collapsing and potentially hazardous.

Vilipa PA# 07-080  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/29/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-080-SE-1	8	135 J	6.9	23.4 J	24.4	283 J	19500	0.089 J	1820	14 J	242 J	8 U	650 J	NR
07-080-SE-2	14	188 J	14.6	72 J	14.5	425 J	24300	0.074 J	3840	26 J	899 J	8 U	1170 J	NR
07-080-SE-3	5 U	61.3 J	3.3	8.2 J	23.9	33.8 J	10700	0.03 J	372	12 J	100 J	6 U	315 J	NR
07-080-WR-1	14	137 J	2.1	5 J	17.6	108 J	18100	0.917 J	294	10 J	775 J	7 U	258 J	NR
07-080-WR-2	20	130 J	1.6	6 J	36.9	151 J	22000	0.397 J	217	6 J	530 J	7 U	128 J	NR
BACKGROUND	10.5	131	1.4	6.83	22.2	26.1	20600	0.048 U	607	15.6	667	3.39 UJ	548	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE %	SULFUR ACID BASE POTENT. %
07-080-WR-1	0.88	27.5	20.6	-6.85	0.31	0.39	12.2	8.45
07-080-WR-2	0.20	6.25	1.78	-4.47	0.06	0.01	0.31	1.46

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-080-SW-1	3.22	21.8	2.57 U	9.7 U	6.83 U	18.9	143 J	0.11	24.9	12.7 U	1.8 J	30.7 U	201	36.6
07-080-SW-2	3.51	21.3	2.57 U	9.7 U	6.83 U	20.1	139 J	0.12	23.3	12.7 U	1.5 J	30.7 U	203	34.6
07-080-SW-3	4.05	17.9	2.57 U	9.7 U	6.83 U	4.83	102 J	0.065	4.08 U	12.7 U	1 J	30.7 U	71.8	33.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-080-SW-1	87	< 5.0	27	< 0.05	NR
07-080-SW-2	102	< 5.0	25	< 0.05	NR
07-080-SW-3	85	< 5.0	18	< 0.05	NR

LEGEND

- SE1 - Downstream of site on McKay Creek  
SE2 - McKay Creek between WR-3 and WR-4  
SE3 - Upstream from site on McKay Creek  
WR1 - Composite of subsamples WR1A, 2A, 3A, 3B, and 3C.  
BACKGROUND - From the Silver Dyke Adit (07-135-SB-1)
- SW1 - Same as SE-1  
SW2 - Same as SE-2  
SW3 - Same as SE-3

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Hartley</u> Legal Description: T <u>14N</u> R <u>8E</u> Mining District: <u>Neihart</u> Latitude: <u>N 46° 56' 17"</u> Longitude: <u>W 110° 43' 41"</u> Land Status: <u>Private</u> Quad: <u>Neihart</u> Inspectors: <u>Tuesday, Belanger, Clark, West</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Cascade</u> Section(s): <u>NE 1/4, NE 1/4, Section 32</u> Mine Type: <u>Hardrock/Ag. Pb. Zn</u> Primary Drainage: <u>Belt Creek</u> USGS Code: <u>10030105</u> Secondary Drainage: <u>Compromise Gulch</u> Date Investigated: <u>June 8, 1994</u> P.A. # <u>07-082</u>
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- The volume of tailings observed at the site was estimated to be 255 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 105J mg/kg	Manganese: 13,800J mg/kg
Arsenic: 133 mg/kg	Nickel: 48.9 mg/kg
Barium: 658 mg/kg	Lead: 13,900JX mg/kg
Cadmium: 28.9JX mg/kg	Antimony: 21.4J mg/kg
Copper: 118J mg/kg	Zinc: 6,650 mg/kg
Mercury: 0.32 mg/kg	
  
- The volume of waste rock observed at the site was estimated to be 21,860 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 64.1J to 69.9J mg/kg	Arsenic: 46.3 to 72.9 mg/kg
Barium: 574 mg/kg	Cadmium: 28.1JX to 34.2JX mg/kg
Copper: 64.2J to 266J mg/kg	Mercury: 1.66 mg/kg
Manganese: 3,570J to 7,970J mg/kg	Nickel: 35.7 mg/kg
Lead: 3,260JX to 6,270JX mg/kg	Zinc: 6,310 to 8,490 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
  
- Intermittent Compromise Gulch passes through the center of the site. Compromise Gulch was dry throughout most of the site during the investigation; however, water was flowing near the lower (southeast) boundary. Observed releases to Compromise Gulch (sediment) were documented for arsenic, manganese, lead, antimony, and zinc. No MCLs were exceeded in the downstream surface water sample; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded.

Hartley PA# 07-082  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/08/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-082-SE1	103 J	160	939	29.5 JX	15.5 J	16.4 J	81.0 J	48600	0.16	19800 J	47.8	7980 JX	54.2 J	5340	NR
07-082-SE2	77.7 J	28.6	971	17.4 JX	8.66 J	31.9 J	98.2 J	18900	0.07	1160 J	33.5	1010 JX	8.6 UJ	1000	NR
07-082-TP1	105 J	133	658	28.9 JX	19.6 J	21.8 J	118 J	42000	0.32	13800 J	48.9	13900 JX	21.4 J	8650	NR
07-082-WR1	69.9 J	46.3	574	34.2 JX	6.51 J	21.5 J	286 J	15700	1.66	3570 J	17.1	3260 JX	12.7 J	8490	NR
07-082-WR2	64.1 J	72.9	211	28.1 JX	15.8 J	21.6 J	64.2 J	27100	0.06	7970 J	35.7	6270 JX	12.6 J	6310	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	U/1000	%	U/1000	POTENT.	U/1000	POTENT.	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	POTENT.	U/1000
07-082-TP1	0.89	27.8	21.3	-6.5	0.06	0.39	0.44	12.2	9.14									
07-082-WR1	1.26	39.4	43.9	4.58	0.18	0.60	18.7	25.2										
07-082-WR2	0.64	20.0	40.7	20.7	0.08	0.32	10.0	30.7										

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-082-SW1	0.76	1.1 U	37.8	2.6 U	8.7 U	4.7 UX	4.6 U	146	0.11 U	4.4 U	8.0 U	9.7	29.4 U	494	70.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-082-SW1	143	<5	39	0.28	NR

LEGEND

SE1 - Approximately 100' downgradient of WRA.  
SE2 - Approximately 50' above the mine area.  
TP1 - Composite of subsamples TP1A, 1B, and 1C.  
WR1 - Composite of subsamples WR1, 2, and 3.  
WR2 - Composite of subsamples WR4 and 5.  
BACKGROUND - From the Rhyolite Mine (07-163-SB1).

SW1 - Same as sample 07-082-SE1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Molton</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 29</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 56' 21"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 44' 07"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 29, 199</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>07-084</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 100,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 274 mg/kg  
Copper: 165J mg/kg  
Mercury: 0.622J mg/kg
- There were two adit discharges associated with this site. GW-1 was a sample from the discharge associated with the large adit and dump in the drainage directly upstream from the main level shaft area. This discharge had a flow of approximately 40 gpm, a pH of 7.9, and a specific conductance of 450 umhos/cm. None of the MCLs or MCLGs were exceeded in this sample. The acute aquatic life criteria for zinc and the chronic aquatic life criteria for lead and zinc were exceeded in this sample. GW-2 was a sample from the discharge associated with the caved adit on the hillside north of the main level shaft area. This discharge had a flow of approximately 15 gpm, a pH of 5.75, and a specific conductance of 930 umhos/cm. The MCL/MCLGs for cadmium, nickel, and antimony were exceeded in this sample. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead and zinc. This discharge seeped back into the ground prior to reaching the drainage below.
- Rock Creek, a small perennial tributary to Belt Creek flowed though the site. Surface water samples did not document an observed release of any of the metals analyzed. The MCL for cadmium and aquatic life criteria for lead and zinc were exceeded both up and down stream of this site and therefore, were not directly attributable to this site. The stream sediment data did document an observed release of mercury.
- Six large transformers remained on site, possibly containing PCBs.

Molton PA# 07-084  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/28/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-084-SE-1	102 J	348 J	62.5 J	35.1	25.7 J	123 J	34400	2.75 JX	16200	31	4440	21 J	11400 J	NR
07-084-SE-2	149 J	292 J	23.6 J	63.5	29 J	113 J	87500	0.351 JX	20400	34	5320	9 J	4890 J	NR
07-084-WR-1	79	470 J	24	10 J	7.4	40.8 J	31200	0.144 J	16000	24 J	4230 J	8 J	5290 J	NR
07-084-WR-2	274	889 J	3.6	5.7 J	42.6	165 J	37000	0.622 J	1230	19 J	4250 J	8 J	705 J	NR
BACKGROUND	53.3	828	15.3	11.6	72.7	50.1	30600	0.051 U	10400	91.5	5110	2.99 UJ	3530	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
07-084-WR-1	1.77	55.3	29.7	25.6	0.30	0.74	0.73	23.1	0.19	2.19	6.56	10.1				
07-084-WR-2	0.86	26.9	12.3	-14.5	0.60	0.07	0.19	2.19								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-084-GW-1	2.64 J	20.3	2.83	9.7 U	6.83 U	1.55 U	199	0.13 J	1750	12.7 U	10	30.7 U	2610	204
07-084-GW-2	2.48 J	23.8	173	35.1	6.83 U	72.1	210	0.1 J	51000	231	775	43	33100	362
07-084-SW-1	2.93	22.8	34.3	9.7 U	6.83 U	11.5	582 J	0.094	5900	38.2	20.4 J	30.7 U	11000	130
07-084-SW-2	2.46	26.9	33.3	9.7 U	6.83 U	11.5	869 J	0.094	6890	33.3	21.8 J	30.7 U	11200	105

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE	
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
07-084-GW-1	516	< 5.0	4800	< 0.05	NR					
07-084-GW-2	807	< 5.0	168	< 0.05	NR					
07-084-SW-1	243	< 5.0	149	< 0.05	NR					
07-084-SW-2	189	< 5.0	130	< 0.05	NR					

LEGEND

SE1 - Rock Creek downgradient, 330' below waste rock dump 3.  
SE2 - Rock Creek, approximately 100' above waste rock dump 2.  
WR1 - Composite of subsamples WR1A, 2A, and 2B.  
WR2 - Composite of subsamples WR3A, 3B, 3C, and 4A.  
BACKGROUND - From the Compromise Mine (07-100-SS-1).  
GW1 - Adit at waste rock dump 2 (Adit #2).  
GW2 - Adit on North hill above shaft.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Queen of the Hills</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SE 1/4, SW 1/4, Section 29</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Pb. Zn</u>
Latitude: <u>N 46° 56' 19"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 44' 25"</u>	USGS Code: <u>100301015</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 8 and 10, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>07-085</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site. Tailings from this mill may have been disposed of at the Neihart Tailings site (07-154) located approximately 1/4 mile downstream on Belt Creek.
- The volume of waste rock observed at the site was estimated to be 54,640 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 21.8J to 95.8J mg/kg	Manganese: 4,410J to 32,800J mg/kg
Arsenic: 43.1 to 683 mg/kg	Nickel: 34.7 mg/kg
Barium: 545 to 753 mg/kg	Lead: 1,810JX to 13,900JX mg/kg
Cadmium: 11.4JX to 90.4JX mg/kg	Antimony: 21.8J to 40.1J mg/kg
Copper: 75.4J to 229J mg/kg	Zinc: 2,580 to 21,000 mg
Mercury: 0.26 to 0.44 mg/kg	
- One discharging adit that seeped into waste rock after flowing a short distance was observed at the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for zinc were exceeded.
- No surface water or sediment samples were collected during the investigation due to the extended distance to the nearest surface water (Rock Creek) and the lack of a direct runoff route.
- Potential safety hazards observed at the site included three open adits and several collapsing structures.

Queen of the Hills PA# 07-085  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/08 & 10/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-085-WR1	95.8 J	683	753	90.4 JX	19.4 J	5.86 J	229 J	54800	0.26	32800 J	34.7	13900 JX	40.1 J	21000	NR
07-085-WR2	48.7 J	172	570	49.6 JX	14.6 J	12.4 J	75.4 J	35700	0.33	13200 J	28.1	5700 JX	21.8 J	11500	NR
07-085-WR3	21.8 J	43.1	545	11.4 JX	11.9 J	19.9 J	27.1 J	13100	0.44	4410 J	19.5	1810 JX	6.5 J	2580	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR POTENT.		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	ACID BASE	1/1000	ACID BASE	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	ACID BASE	POTENT.
07-085-WR1	3.35	105	38.5	38.5	-68	-0.01	1.57	49.0	2.00	49.0	2.00	49.0	2.00	49.0	-10.6	
07-085-WR2	1.31	40.9	36.5	36.5	-4.5	0.25	0.39	12.2	0.87	12.2	0.87	12.2	0.31	24.3		
07-085-WR3	0.17	5.31	11.1	11.1	5.80	0.11	0.01	0.31	0.05	0.31	0.05	0.31	0.31	10.8		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-085-AD1	0.44	1.1 U	42.2	2.6 U	8.7 U	4.7 UX	4.6 U	34.2	0.11 U	57.8	8.0 U	1.8	29.4 U	1120	260

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-085-AD1	331	<5	176	0.08	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.  
WR2 - Composite of subsamples WR2A and 2B.  
WR3 - Composite of subsamples WR3, 4, and 5.  
BACKGROUND - From the Ripple Mine (07-163-581).

AD1 - All #2 dachshaus.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Evening Star Mine/Millsite</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 29</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 56' 39"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 44' 46"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Belt Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 2, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>07-087</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 1,200 cubic yards. Precipitation was observed to have collected on TP-1. The following elements were elevated at least three times background:  
Barium: 4,150 mg/kg      Mercury: 0.277 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 9,984 cubic yards. The following elements were elevated at least three times background:  
Copper: 160 mg/kg      Mercury: 0.186 to 0.301 mg/kg
- One discharging adit was observed at the site during the investigation; after flowing through WR-1, the discharge seeped into the ground. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for zinc were exceeded. The pH measurement in the adit discharge was 6.48. No other groundwater or surface water samples were collected during the investigation
- One potentially hazardous adit opening was identified at the site; also, nine potentially hazardous structures were identified.
- The mill building contained numerous barrels and bags of various hazardous and unknown materials; all barrels were in poor condition.

Evening Star Mill PA# 07-087  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-087-TP-1	104	4150	32.1	6.49	29.3	98.1	30000	0.277	11000	90.9	5860	5.47 J	7730	1.371 U
07-087-WR-1	86.3	233	26.6	13.4	10.6	160	45000	0.301	12000	87.5	14800	3.58 J	6840	NR
07-087-WR-2	34 J	640 J	7.9	17.5	35.5 J	46.3 J	34700	0.186	8150	93.4	5370	6.56 J	1910	NR
BACKGROUND	53.3	828	15	11.6	72.7	50.1	30600	0.051 U	10400	91.5	5110	2.99 UJ	3530	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
07-087-TP1	1.24	38.7	28.6	-10	0.26	0.68	0.3	21.2	7.36			
07-087-WR1	2.47	77.2	34	-43	0.28	1.22	0.97	38.1	-4.14			
07-087-WR2	0.76	23.7	64.6	40.8	0.23	0.24	0.29	7.5	57.1			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-087-GW-1	0.98 U	6.4	2.55 U	5.99 U	8.93 J	3.23 J	184	0.038 U	8560	86.8	6.64	18.3 U	606 JX	489

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-087-GW-1	613 <	5.0	215	< 0.05	NR

LEGEND

TP1 - Composite of subsamples TP2A, 1A, and 1B.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Sample of the WR2 subsample.  
BACKGROUND - From the Compromise Mine (07-100-SS-1).

GW1 - Sample from the Evening Star edit.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Compromise  
Legal Description: T 14N R 8E  
Mining District: Neihart  
Latitude: N 46° 56' 16"  
Longitude: W 110° 44' 05"  
Land Status: Private/Public  
Quad: Neihart  
Inspectors: Bullock, Flammang, Clark  
Organization: Pioneer Technical Services, Inc.

County: Cascade  
Section(s): NW 1/4, NE 1/4, Sec. 32  
Mine Type: Hardrock/Aq. Au, Pb, Zn  
Primary Drainage: Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Compromise Gulch  
Date Investigated: June 1, 1993  
P.A. # 07-100

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 600 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 164 to 177 mg/kg      Mercury: 0.245 to 0.516 mg/kg
- Two discharging adits and one discharging shaft were identified at the site. MCLs for cadmium and nickel were exceeded in the shaft discharge (GW-1), no MCLs were exceeded in either of the adit discharges. Acute and chronic aquatic life criteria were exceeded for zinc in the shaft discharge as well as chronic aquatic life criteria for iron, mercury, cadmium and lead. Acute and chronic aquatic life criteria were exceeded for zinc in both adit discharges (GW-2 and GW-3), and chronic aquatic life criteria were exceeded for mercury and lead in both adit discharges. Chronic aquatic life criteria were exceeded for iron and copper in the Adit #1 discharge (GW-2).
- The intermittent Compromise Gulch was flowing directly through the site. Three surface water samples were collected from Compromise Gulch during the investigation (upstream, center of site, and downstream). Downstream iron, manganese, nickel, and zinc concentrations were elevated at least three times the upstream concentrations, but were not significantly elevated in the source samples; thus not directly attributable to this site. The MCL/MCLG for nickel was exceeded in the downstream sample. Acute and chronic aquatic life criteria were exceeded for several elements in both the upstream and downstream samples, and were therefore not directly attributable to this site. An observed release to Compromise Gulch was documented for arsenic (sediment).
- One potentially hazardous mine opening (Shaft #1, fenced) was identified at the site. Potentially hazardous structures included the headframe associated with Shaft #1 and two highwalls ranging in height from 15 to 30 feet.
- A recreational cabin was identified at the south end of the site and the site was also determined to be in close proximity to the town of Neihart.

Compromise PA# 07-100  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/01/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-100-SE-1	56.2	690	22.5	163	11.1	35.6	30100	0.064 U	86100	604	772	4.18 UJ	5600	NR
07-100-SE-2	78.7	1250	10.7	9.61	11.5	38.6	24600	0.147	8700	66.8	3690	3.19 UJ	2470	NR
07-100-SE-3	6.93	146	0.7	8.98	10.4	9.04	23600	0.059 U	854	15.6	31.7	2.74 UJ	189	NR
07-100-WR-1	164	323	19.4	16.5	8.64	90.7	43600	0.516	14500	89.8	6890	3.59 UJ	3810	NR
07-100-WR-4	177	311	29.9	20.7	9.29	65.4	43500	0.245	8560	63.5	3160	3.38 UJ	7520	NR
BACKGROUND	53.3	828	15.3	11.6	72.7	50.1	30600	0.051 U	10400	91.5	5110	2.99 UJ	3530	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
07-100-WR1	1.12	35	41.4	6.38	0.21	0.48	0.43	15	26.4							

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-100-GW-1	7.61	7.73	10.2 J	80.7	12.6	25.1	16600 J	0.200	45200 JX	447	34 J	18.3 U	8780	490
07-100-GW-2	3.72	74.3	2.55 U	5.99 U	5 U	10.6	1380 J	0.210	140 JX	47.8	11.2 J	18.3 U	164	81.1
07-100-GW-3	3.48	22.2	2.55 U	5.99 U	5 U	5.77	199 J	0.100	60.4 JX	8.78 U	4.21 J	18.3 U	165	50.5
07-100-SW-1	6.17	11	2.55 U	10.9	5 U	15	12500 J	0.160	7450 JX	106	123 J	18.3 U	3660	262
07-100-SW-2	2.98	43.2	2.55 U	5.99 U	5 U	13.1	152 J	0.170	71.8 JX	8.78 U	9.77 J	18.3 U	454	57.7
07-100-SW-3	4.53	171	2.55 U	5.99 U	5 U	14.1	760 J	0.230	358 JX	9.57	126 J	18.3 U	310	56.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-100-GW-1	845	< 5.0	506	0.08	NR
07-100-GW-2	124	< 5.0	26	< 0.05	NR
07-100-GW-3	79	< 5.0	15	0.05	NR
07-100-SW-1	394	< 5.0	246	< 0.05	NR
07-100-SW-2	80	< 5.0	22	< 0.05	NR
07-100-SW-3	74	< 5.0	21	< 0.05	NR

LEGEND

- SE1 - Below small footbridge in bend in road to cabin, approx. 200' South of cabin.  
SE2 - Below confluence of edit #2 with Compromise Gulch stream.  
SE3 - Upgradient, approx. 200' above waste rock dump 5.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR4 - Composite of subsamples WR4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, and 6C.  
BACKGROUND - 200' Northeast from edit #3, from the Compromise Mine (07-100-SS-1).
- GW1 - From shaft #1 - boiler grab from 10' below SW1.  
GW2 - Collapsed edit #1 - seep.  
GW3 - Collapsed edit #2 - seep.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Carpenter Creek Tailings</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 16; NE 1/4, NW 1/4, Sec. 21</u>
Mining District: <u>Niehart</u>	Mine Type: <u>Mill Tailings</u>
Latitude: <u>N 46° 58' 00"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 01"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Pubic</u>	Secondary Drainage: <u>Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>May 24 and 25, 1993</u>
Inspectors: <u>Tuesday, Babits, Clark, Belanger, Flammang, Lasher/Pierson</u>	P.A. # <u>07-103</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The total volume of mill tailings associated with this site was estimated at 111,000 cubic yards, contained in two impoundments (upper and lower). The following elements were elevated at least three times background:

Arsenic: 34.5 to 139 mg/kg	Barium: 663 to 2,820 mg/kg
Cadmium: 12.4 to 34.2 mg/kg	Cobalt: 21.5 mg/kg
Copper: 1,950 to 3,740 mg/kg	Manganese: 2,100 to 6,870 mg/kg
Lead: 3,750 to 18,500 mg/kg	Zinc: 1,790 to 2,990 mg/kg
- The tailings were poorly contained, and were actively eroding into Carpenter Creek from surface runoff and bank undercutting, and were only 25% vegetated. Tailings materials were observed washing into Carpenter Creek during a storm event.
- No waste rock or flowing adits were associated with this site.
- An observed release to surface water for arsenic, barium, and lead was documented with sediment samples. No exceedences of drinking water standards were documented. Aquatic life criteria exceedences for cadmium, copper, lead, and zinc (acute) and mercury, cadmium, copper, lead, and zinc (chronic) were documented at this site.
- A spring was located in the northeast corner of the lower pond and ponded up by the road. This water eventually crossed the lower tailings and discharged to Carpenter Creek.
- No hazardous structures or openings existed at the site, though several old cabins at the site were unsafe.

**Carpenter Creek Tailings PA# 07-103**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER-TUESDAY**  
**INVESTIGATION DATE: 8/24/93**

**SOLID MATRIX ANALYSES**

**Metals in soils Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-103-LT-1	61.4	927	24.1	11	14.9 J	3450	42600	0.095 J	4720	31.9	7870	4.21 UJ	2370	1.16 U
07-103-LT-2	25.1	2820	30.6	5.49	9.22 J	2740	28600	0.071 J	3950	24.9	4940	3.59 UJ	2150	1.072 U
07-103-SE-1	73	1100	20.3	12.2	13.7 J	3440	43900	0.071 J	4090	30.7	9540	3.99 UJ	1790	NR
07-103-SE-3	139	905	34.2	21.5	11.5 J	3740	49500	0.062 J	4360	36.8	18500	4.06 UJ	1960	NR
07-103-SE-4	46.6	737	25.0	10.2	15.2 J	2670	39000	0.106 J	5030	34.7	6840	3.88 UJ	2090	NR
07-103-SE-5	34.5	168	12.4	8.72	9.27 J	2910	28000	0.045 J	2100	16.7	5100	3.33 UJ	1090	NR
07-103-UT-1	69.8	663	28.0	11.3	19.2	2850	47500	0.015 U	6830	45.8	4620	5.27 J	2990	1.194 U
07-103-UT-2	36.6	1200	21.3	9.93	16.1	1950	40700	0.019 U	6870	45.4	3750	5.24 J	2050	1.231 U
BACKGROUND	10.5	131	1.4	6.83	22.2	26.1	20600	0.048 U	607	15.6	667	3.39 UJ	548	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000t	SULFUR ACID BASE POTENT. v/1000t
07-103-LT-1	1.21	37.8	25.1	-13	0.09	0.5	0.61	15.9	9.16
07-103-LT-2	0.5	15.6	16.1	0.43	0.2	0.15	0.15	4.69	11.4
07-103-UT1	0.42	13.1	23.4	10.3	0.07	0.05	0.30	1.56	21.9
07-103-UT2	0.57	17.8	21.2	3.40	0.12	0.13	0.32	4.06	17.1

**WATER MATRIX ANALYSES**

**Metals in Water Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
07-103-SW-1	2.6	18.6	4.13	5.99 U	8.53 J	62.9 J	174	0.064 J	243	8.78 U	42	18.3 U	560	32.8
07-103-SW-3	2.17	18.3	4.5	5.99 U	5.1 J	62.2 J	226	0.15 J	249	8.78 U	45.8	18.3 U	549	32.9
07-103-SW-4	2.58	14.9	4.4	5.99 U	5 U	54.9 J	127	0.088 J	244	8.78 U	24.8	18.3 U	539	30.2
07-103-SW-5	2.81	15.8	3.37	5.99 U	6.67 J	56.2 J	148	0.083 J	252	9.57	30.4	18.3 U	526	28.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-103-SW-1	83	< 5.0	14	< 0.05	NR
07-103-SW-3	85	< 5.0	17	< 0.05	NR
07-103-SW-4	74	< 5.0	14	< 0.05	NR
07-103-SW-5	74	< 5.0	10	< 0.05	NR

**LEGEND**

- LT1 - Composite of subsamples LT-1A, -2A, -3A, and -4A.
- LT2 - Composite of subsamples LT-1D, -2D, -3C, and -4B.
- SE1 - Just above confluence of Carpenter Creek with Snow Creek approximately 750 feet from SE1.
- SE3 - At PPE of lower tailings pond in Carpenter Creek.
- SE4 - At PPE of upper tailings pond in Carpenter Creek.
- SE5 - Upgradient of upper tailings pond in Carpenter Creek.
- UT1 - Composite of subsamples UT1B, 2A, and 3B.
- UT2 - Composite of subsamples UT1D, 2C, and 3C.
- BACKGROUND - From Silver Dike Adit (07-135-SS-1).
- SW1 - Above Snow Creek confluence in Carpenter Creek.
- SW3 - Same as sample SE3.
- SW4 - Same as sample SE4.
- SW5 - Same as sample SE5.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Rochester</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 29</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Au, Ag, Zn, Pb</u>
Latitude: <u>N 46° 56' 24"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 46"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 2, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>07-110</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were associated with this site.
- The volume of waste rock associated with this site was estimated to be 3,280 cubic yards. The following elements were elevated at least three times background:

Arsenic: 193J mg/kg	Barium: 744J to 1,110J mg/kg
Cadmium: 7.3 to 136 mg/kg	Chromium: 37.9J mg/kg
Copper: 47.4J to 205J mg/kg	Iron: 38,800 to 40,900 mg/kg
Mercury: 0.65 mg/kg	Nickel: 76.5 to 160 mg/kg
Lead: 3,580 to 10,700 mg/kg	Antimony: 51.4J mg/kg
Zinc: 2,060 to 29,700 mg/kg	
- The waste rock dumps had only sparse vegetated.
- Rock Creek was flowing adjacent to WR-6 and undercutting the waste dump and formed an unstable highwall. No samples of Rock Creek were collected. The pH and specific conductance ranged from 5.77, and 330 umhos/cm upstream to 5.94 and, 420 umhos/cm downstream.
- No observed releases, exceedances of drinking water standards or aquatic life criteria were documented at this site.
- No discharging adits, springs or seeps were observed.
- Four hazardous openings existed at the site: partially caved shafts with steep sides.

Rochester PA# 07-110  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - TUESDAY  
 INVESTIGATION DATE: 06/02/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-110-WR-5	193 J	1110 J	136.0	14.7	37.9 J	205 J	38800	0.65	27700	160	10700	51.4 J	29700	NR
07-110-WR-6	32.5 J	744 J	7.3	15.1	14.3 J	47.4 J	40900	0.354	13100	76.5	3580	4.11 J	2060	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE U/1000x	NEUTRAL POTENT. U/1000x	SULFUR ACID BASE POTENT. U/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE U/1000x	SULFUR ACID BASE POTENT. U/1000x
07-110-WR5	1.32	41.2	141	99.8	0.03	0.47	0.82	14.7	126
07-110-WR6	0.74	23.1	39.4	16.3	0.22	0.23	0.29	7.19	32.3

LEGEND

WR5 - Composite of subsamples WR5A, 5B, 5C, and 5D.  
 WR6 - Composite of subsamples WR6A, 6B, and 6C.  
 BACKGROUND - From the Maud S. Mine (07-129-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Silver Belt</u>	County: <u>Cascade</u>
Legal Description: <u>T 14 N R 8 E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn, Au</u>
Latitude: <u>N 46° 56' 39"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 15"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 30, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>07-111</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no tailings at this site.
- The volume of uncovered waste rock on site was estimated to be approximately 9,005 cubic yards. The following were elevated at least three times background:

Arsenic: 500 to 581 mg/kg	Cadmium: 35.3 J to 83.8J mg/kg
Copper: 116J to 135J mg/kg	Iron: 57,900 to 59,300 mg/kg
Mercury: 0.645JX mg/kg	Manganese: 2,620 to 3,080 mg/kg
Lead: 4,180 to 5,350 mg/kg	Antimony 24J to 28J mg/kg
Zinc: 9,500J to 18,300J mg/kg	
- One adit discharge was identified at the site; the pH measurement was 6.63. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in the adit discharge. Also, the chronic aquatic life criteria for iron and mercury were exceeded in the adit discharge.
- Rock Creek flowed through waste rock located on site. Observed releases to Rock Creek were documented for cadmium, copper, mercury, manganese, and zinc. The MCL for cadmium and acute and chronic aquatic life criteria for cadmium and copper were exceeded in the downstream sample; these exceedances were directly attributable to the site.

Silver Belt PA# 07-111  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/30/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-111-SE-1	144 J	114 J	53.2 J	19.3	7.6 J	187 J	31900	0.143 JX	13200	27	2810	13 J	8060 J	NR
07-111-SE-2	28 J	258 J	10.4 J	13.3	29.8 J	50.9 J	28200	0.104 JX	1010	26	225	17 U	1650 J	NR
07-111-WR-1	581 J	105 J	35.3 J	13.1	29.8 J	116 J	59300	0.39 JX	3080	29	4180	24 J	9500 J	NR
07-111-WR-2	500 J	85.6 J	83.8 J	6	5.1 J	135 J	57900	0.645 JX	2620	5	5350	28 J	18300 J	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
07-111-WR-1	1.56	48.7	5.19	2.45	-43.5	0.89	0.27	0.21	0.02	0.46	0.26	6.56	0.62	-1.37	1.83	
07-111-WR-2	0.55	17.2	2.45	2.45	-14.7	0.27	0.27	0.02	0.02	0.26	0.26	0.62	0.62	-1.37	1.83	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-111-GW-1	4.99 J	3.87	37.9	19.7	6.83 U	28.2	1520	0.11 J	14100	48.6	231	30.7 U	8930	68
07-111-SW-1	2.1 J	19.8	13	9.7 U	6.83 U	10.1	22.7	0.14 J	462	12.7 U	3.93	30.7 U	3800	52.5
07-111-SW-2	2.76 J	34.1	2.57 U	9.7 U	6.83 U	1.55 U	32.8	0.038 U	11.4	12.7 U	1.54	30.7 U	86.8	34

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-111-GW-1	176 < 5.0	109	0.05	NR	NR
07-111-SW-1	97 < 5.0	46	< 0.05	NR	NR
07-111-SW-2	76 < 5.0	6	< 0.05	NR	NR

LEGEND

SE1 - 100 feet below waste rock dump 2 on Rock Creek  
SE2 - Across from cabins above waste rock dump 2.  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From Maud S. Mine (07-129-SS-1).  
SW1 - Same as SE1.  
SW2 - Same as SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Fairplay</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn, Au</u>
Latitude: <u>N 46° 56' 44"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 10"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 30, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>07-112</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no tailings at this site.
- An estimated 2,010 cubic yards of uncovered waste rock were located at this site. The following elements were elevated at least three times background:

Arsenic: 257J mg/kg	Cadmium: 22.9J mg/kg
Copper: 287J mg/kg	Iron: 40,500 mg/kg
Mercury: 1.02JX mg/kg	Manganese: 1,140 mg/kg
Lead: 18,400 mg/kg	Antimony: 20J mg/kg
Zinc: 6,260 mg/kg	
- One discharging adit was identified at the site; the pH measurement was 6.09. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron was exceeded in the adit discharge.
- Waste rock was located approximately 40 feet from an unnamed tributary to Rock Creek. No MCL/MCLG or acute or chronic aquatic life criteria exceedances were attributed to the site.
- An observed release to the unnamed tributary to Rock Creek (sediment) was documented for mercury.
- There were no hazardous openings or structures identified at the site.

**Fairplay PA# 07-112**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/30/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-112-SE-1	21 J	230 J	3.5 J	22.6	48.9 J	36.6 J	43600	0.026 JX	2680	26	455	7 U	763 J	NR
07-111-SE-2	28 J	258 J	10.4 J	13.3	29.8 J	50.9 J	28200	0.104 JX	1010	26	225	17 U	1650 J	NR
07-112-WR-1	257 J	44.2 J	22.9 J	3.5	2.5 J	287 J	40500	1.02 JX	1140	4	19400	20 J	6260 J	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		POTENTIAL
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	
07-112-WR-1	2.48	77.5	47.4	-30.1	0.44	0.98	1.06	30.6									16.8

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-112-GW-1	15.2 J	9.7	22.9	11.5	6.83 U	58.9	8010	0.038 U	2280	12.7 U	92.7	30.7 U	5350	74.1
07-112-SW-1	1.89 J	33.7	2.57 U	9.7 U	6.83 U	1.55 U	37.8	0.066 J	7.9	12.7 U	0.88	30.7 U	20.5	33.9
07-112-SW-2	2.61 J	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	11.8 U	0.1 J	4.08 U	12.7 U	0.72 UJ	30.7 U	7.57 U	0.1
07-111-SW-2	2.76 J	34.1	2.57 U	9.7 U	6.83 U	1.55 U	32.8	0.038 U	11.4	12.7 U	1.54	30.7 U	86.8	34

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-112-GW-1	158	< 5.0	88	< 0.05	NR
07-112-SW-1	67	< 5.0	5	< 0.05	NR
07-112-SW-2	NR	NR	NR	NR	NR
07-111-SW-2	76	< 5.0	6	< 0.05	NR

**LEGEND**

07-111-SE2 - Downgradient sample (From Silver Belt).  
 SE1 - Across from dump where stream first appears.  
 WR1 - A composite of subsamples WR1A and B (2/3 A and 1/3 B).  
 BACKGROUND - From Maud S. Mine (07-129-SS-1).  
 GW1 - Adit discharge from adit #1.  
 07-111-SW2 - Same as 07-111-SE2 sample.  
 SW1 - Same as SE1.  
 SW2 - QA Blank.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Stallabrass</u>	County: <u>Cascade</u>
Legal Description: <u>T 13N R 8E</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 4</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Au (no significant production)</u>
Latitude: <u>N 46° 55' 11"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 24"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Belt Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>July 30, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>07-120</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- Neihart tailings were hauled to this site during highway construction in the late 1970's for driveway cover. The material was not used and was presently stock piled adjacent to the MDT Maintenance facility. The volume of mill tailings was estimated to be 50 cubic yards. The following elements were elevated at least three times background:

Arsenic: 181J mg/kg	Manganese: 7,960 mg/kg
Barium: 3,000J mg/kg	Lead: 7,320 mg/kg
Cadmium: 17.9J mg/kg	Antimony: 14J mg/kg
Copper: 157J mg/kg	Zinc: 4,570J mg/kg
- The volume of waste rock associated with this site was estimated to be 5,458 cubic yards. The following elements were elevated at least three time background:

Arsenic: 165J mg/kg	Mercury: 3.54JX mg/kg
Barium: 2,880J mg/kg	Lead: 1,800 mg/kg
Cadmium: 2.4J mg/kg	Antimony: 27J mg/kg
Copper: 76.1J mg/kg	Zinc: 673J mg/kg
Iron: 36,700 mg/kg	
- There were no discharging mine openings, seeps or springs identified at this site.
- No domestic groundwater wells were present on this site. The residents on this site used water directly from Belt Creek instead of groundwater.
- There were no direct runoff pathways between this site and Belt Creek, located approximately 150 yards from the base of the lower waste rock dump.
- There were 3 adits identified at this site, all classified as hazardous mine openings.

Stallabrass Pa# 07-120  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/30/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-120-TP-1	181 J	3000 J	17.9 J	2.3 U	9.3 J	157 J	30900	0.116 JX	7960	12	7320	14 J	4570 J	NR
07-120-WR-1	165 J	2880 J	2.4 J	5.9	11.5 J	76.1 J	36700	3.54 JX	549	21	1800	27 J	673 J	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR 1/1000x	ACID BASE POTENT. 1/1000x	NEUTRAL. POTENT. 1/1000x	SULFUR ACID BASE POTENT. 1/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000x	SULFUR ACID BASE POTENT. 1/1000x
07-120-TP-1	0.74	23.1	-13.0	10.1	-13.0	<0.01	0.39	0.38	12.2	-2.05
07-120-TP-1DUP	0.72	22.5	-11.6	10.9	-11.6	<0.01	0.38	0.37	11.9	-0.98
07-120-WR-1	0.72	22.5	-8.02	14.5	-8.02	0.35	0.08	0.29	2.50	12.0

LEGEND

TP1 - Pile of Neihart Tailings at MDT maintenance facility.  
WR1 - Composite from unvegetated areas on dump.  
BACKGROUND - From the Maud S. Mine (07-129-SS-1).  
TP1DUP - Duplicates of the 07-120-TP-1 sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Dacotah  
Legal Description: T 14N R 8E  
Mining District: Neihart  
Latitude: N 46° 56' 45"  
Longitude: W 110° 43' 24"  
Land Status: Private/Public  
Quad: Neihart  
Inspectors: Bullock, Babits, Flammang,  
Lasher, Clark/Pierson  
Organization: Pioneer Technical Services, Inc.

County: Cascade  
Section(s): NW 1/4, SW 1/4, Sec. 28  
Mine Type: Hardrock/Ag, Pb, Zn  
Primary Drainage: Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Rock Creek  
Date Investigated: June 8, 1993  
P.A. # 07-121

- There were no tailings on site.
- There were approximately 10,015 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 83 to 255J mg/kg	Cadmium: 9.3J to 40.1 mg/kg
Copper: 66.2J to 129 mg/kg	Iron: 36,300 to 67,500 mg/kg
Mercury: 0.793J mg/kg	Manganese: 2,550 to 12,800J mg/kg
Nickel: 84J mg/kg	Lead: 1,780 to 21,800 mg/kg
Antimony: 26J mg/kg	Zinc: 3,110J to 10,200 mg/kg
- There was one discharging adit on site which entered Belt Creek. A sample of the discharge revealed a pH of 2.38. MCLs for cadmium, nickel, and antimony and acute and chronic aquatic life criteria were exceeded for cadmium and zinc in the adit discharge. Additionally, chronic aquatic life criteria were exceeded for iron, mercury copper, lead, and nickel.
- The Belt Creek flowed immediately adjacent to the site. Observed releases to Belt Creek were documented for cadmium, copper, iron, manganese, nickel, lead, and zinc. The MCL for nickle was exceeded in the downstream sample, which was directly attributable to the site. Additionally, chronic aquatic life criteria were exceeded for iron and copper in the downstream sample, again attributable to the site.
- There was one open adit, numerous hazardous structures, and highwalls on site.

Dacotah PA# 07-121  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-121-SE-1	38	98.9	63.2 J	13.6 J	33.4	541 J	9170	0.178 J	7920 J	92 J	398	14 U	11300 J	NR
07-121-SE-2	126	133	3 J	6.1 J	12.1	26.6 J	65200	0.063 J	1000 J	12 J	1710	4 U	1270 J	NR
07-121-WR-1	105	56.1	14.9 J	17.8 J	7.5	78.8 J	36300	0.105 J	12800 J	84 J	1780	4 U	4650 J	NR
07-121-WR-5	83	144	9.3 J	2 J	10.3	66.2 J	67500	0.793 J	379 J	4 J	7510	4 U	3110 J	NR
07-121-WR-6	255 J	205	40.1	5.6	5.3	129	40000	0.416	2550	20 J	21800	26 J	10200	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE V/1000	NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	SULFUR ACID BASE %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE V/1000	SULFUR ACID BASE POTENT. V/1000
07-121-WR-1	3.25	102	37.8	-64	1.13	1.56	0.56	17.5	20.3
07-121-WR-5	2.37	74	6.28	-68	1.87	0.47	0.03	0.94	5.34
07-121-WR-6DUP	1.65	51.5	7.7	-44	0.56	0.8	0.29	9.06	-1.36
07-121-WR-6	1.63	50.9	7.56	-43	0.54	0.82	0.27	8.43	-0.88

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-121-GW-1	5.13	2.24 U	420	196	21.2	90.1	52600	0.047	152000	951	216	220	172000	785
07-121-SW-1	1.61 U	17.7	10.7	5.99 U	6.67	5.07	95.9	0.078	231	12.6	2.52	21.8	3060	51.9
07-121-SW-2	1.96	15	65.9	14	5.33	21.4	1580	0.11	16400	124	48	43.9	22600	141

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-121-GW-1	2330	< 5.0	1400	< 0.05	NR
07-121-SW-1	96	< 5.0	53	< 0.05	NR
07-121-SW-2	340	< 5.0	170	0.06	NR

LEGEND

- SE1 - Upland of Decotah, downgradient of Fairplay.  
SE2 - Sample of Rock Creek at base of waste rock dump 1.  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.  
WR3 - Composite of subsamples WR3, 5A, 5B, 9A, and 9B.  
WR6 - Composite of subsamples WR6, 7, and 8.  
BACKGROUND - From the Maud S. Mine (07-129-SS-1).
- GW1 - Discharge from edit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Maud S.</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Pb, Zn</u>
Latitude: <u>N 46° 56' 25"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 18"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rock Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 9, 1993</u>
Inspectors: <u>Babits, Flammang</u>	P.A. # <u>07-129</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings on site.
  
- There were approximately 1,800 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 1,380J mg/kg	Barium: 526 mg/kg
Cadmium: 35.9 mg/kg	Copper: 159 mg/kg
Iron: 55,600 mg/kg	Mercury: 1.11 mg/kg
Manganese: 8,290 mg/kg	Nickel: 55J mg/kg
Lead: 7,880 mg/kg	Lead: 7,880 mg/kg
Antimony: 18J mg/kg	Zinc: 5,610 mg/kg
  
- One adit was identified on site, which held water but was not discharging. The pH of the adit discharge was 6.51. MCLs for cadmium and antimony and acute and chronic aquatic life criteria for cadmium, copper, lead and zinc were exceeded in the sample.
  
- There was no surface water on site. The nearest surface water was Rock Creek located approximately 0.5 miles away. No surface water or sediment samples were collected.

Maud S. PA# 07-129  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BABITS  
 INVESTIGATION DATE: 06/08/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-129-WR-1	1380 J	526	35.9	17.9	27	159	55600	1.11	8290	55 J	7880	18 J	5610	NR
BACKGROUND	19 J	110	0.4 UJ	7.4	10.4	11	12000	0.142	320	10 J	138	3 UJ	115	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	ACID BASE	SULFUR	POTENT.	SULFUR	POTENT.	SULFUR	POTENT.	SULFUR	POTENT.	SULFUR	POTENT.	ACID BASE	POTENT.
	%	U/1000	U/1000	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
07-129-WR-1	1.14	44	7.25	-37	1.07	0.04	0.3	1.25	6							

WATER MATRIX ANALYSES

Metals in Water  
 Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-129-GW-1	1.61 U	19.5	42.6	5.99 U	5 U	22	89	0.14	2730	31.9	228	28.2	6260	31
07-129-GW-2	1.74	19.2	39.5	5.99 U	7.67	21.9	63.9	0.15	2710	33.3	222	30.2	6360	31.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
 Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-129-GW-1	64 < 5.0	43	0.11	NR	
07-129-GW-2	51 < 5.0	40	0.12	NR	

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 BACKGROUND - Approx. 150-200 feet above edit.  
 From Maud S. Mine (07-129-SS-1).  
 GW1 - Filled edit.  
 GW2 - Duplicate of sample 07-129-GW-1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Neihart Tailings</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 29</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Mill Tailings Pond</u>
Latitude: <u>N 46° 56' 30"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 44' 40"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Belt Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 2, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>07-134</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 23,000 cubic yards of tailings associated with this site. The following elements were elevated at least three times background:

Arsenic: 190 to 284 mg/kg	Cadmium: 47.4 to 63.1 mg/kg
Lead: 37,400 mg/kg	Antimony: 10.1J to 17.4J mg/kg
Zinc: 10,400 to 14,000 mg/kg	
- There was no waste rock associated with this site.
- There were no discharging adits or shafts associated with this site.
- Belt Creek flowed between the tailings impoundment and U.S. Highway 89. The northeastern side of the tailings impoundment was heavily riprapped during a highway reconstruction project in the 1970's. A run-on diversion ditch, discharged into a small wetlands and then into Belt Creek which encircled the southern end of this site. A sample collected from the wetlands discharge did not exceed any MCL/MCLGs, but did exceed acute aquatic life criteria for cadmium and zinc, as well as chronic aquatic life criteria for cadmium, copper, lead, and zinc. Surface water samples were not collected in Belt Creek due to dilution effects from very high flowrates. Stream sediment samples from Belt Creek documented an observed release of arsenic, directly attributable to this site.
- One residence was located adjacent to this site, but did not appear to have been recently occupied.

Neilhart Tailings PA# 07-134  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-134-SE-1	27.2	2440	93.1	11.5	15.5	67.7	17100	0.105 U	71500	488	1060	26.2 J	22800	2.277
07-134-SE-2	8	224	1.0	9.33	18.8	14.1	18400	0.083	865	26.9	327	3.93 UJ	528	1.289 U
07-134-SE-3	29.2	600	3.8	9.02	16	29.8	20100	0.05 U	2240	29.7	792	2.87 UJ	1170	1.227 U
07-134-TP-1-1	190	1630	47.4	3.96	7.31	223	33100	0.118	11100	63.4	10100	10.8 J	11400	1.213 U
07-134-TP-1-2	284	984	63.1	17.8	15.3	371	38300	0.121	20700	151	11400	17.4 J	14000	1.283 U
07-134-TP-2	234	38.7	40.7	5.4	4.22	62.7	53600	0.061 U	707	9.14	37400	10.1 J	10400	1.2 U
BACKGROUND	53.3	828	15.3	11.6	72.7	50.1	30600	0.051 U	10400	91.5	5110	2.99 UJ	3530	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
07-134-TP1-1	1.64	51.2	17.7	-34	0.53	0.55	17.2	0.54
07-134-TP1-2DUP	3.39	106	26.5	-79	1.17	2.07	64.7	-38.2
07-134-TP1-2	3.37	105	26.3	-79	1.17	2.04	63.7	-37.4
07-134-TP-2	4.94	154	-9.1	-163	1.64	0.86	26.9	-35.9
07-134-TP-2DUP	4.96	155	-9.3	-164	1.63	0.88	27.5	-36.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-134-SW-1	0.98 U	41.6	3	5.99 U	5 U	8.9 J	223	0.038 U	660	16	12.1	18.3 U	1580 JX	57.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-134-SW-1	86	< 5.0	28	< 0.05	0.01

LEGEND

- SE1 - Same as sample SW1.
- SE2 - Upgradient Belt Creek Tailings.
- SE3 - Downgradient of Belt Creek Tailings.
- TP1-1 - Composite of oxidized zone; from holes 2-5 in tailings pond 1.
- TP1-2 - Composite of TP2-1-1 and TP2-2-1.
- TP2 - Composite of reduced zone; from holes 2-5 in tailings pond 1.
- BACKGROUND - From Composite (07-1000-SS-1).
- TP1-2DUP - Duplicate of sample 07-134-TP1-2.
- TP2DUP - Duplicate of sample 07-134-TP-2.
- SW1 - Outlet of Belt Creek of Belt Creek of settling pond associated with diversion ditch.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Silver Dyke Adit  
Legal Description: T 14N R 8E  
Mining District: Neihart  
Latitude: N 46° 58' 57"  
Longitude: W 110° 41' 48"  
Land Status: Private/Public  
Quad: Neihart  
Inspectors: Tuesday, Belanger, Lasher  
Organization: Pioneer Technical Services, Inc.

County: Cascade  
Section(s): SE 1/4, SW 1/4, Sec. 10  
Mine Type: Hardrock / Ag, Pb, Zn  
Primary Drainage: Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Squaw Creek  
Date Investigated: June 1, 1993  
P.A. # 07-135

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 12,100 cubic yards. The following elements were elevated at least three times background:

Arsenic: 124 to 217 mg/kg	Cadmium: 48.6 to 72.7 mg/kg
Copper: 2,530 to 3,330 mg/kg	Iron: 80,900 mg/kg
Mercury: 0.66 to 1.35 mg/kg	Manganese: 4,040 mg/kg
Lead: 16,400 to 31,800 mg/kg	Zinc: 6,050 to 7,050 mg/kg
- The waste rock dumps were unvegetated.
- One discharging adit had a significant flow (1 cfs). The adit water (SW-1) had a pH of 5.12, a high specific conductance of 2,450 us/cm, and exceeded drinking water standards for cadmium, copper, nickel, and antimony; aquatic life criteria for lead, mercury, cadmium, copper, lead, and zinc (chronic) and cadmium, copper, and zinc (acute) were exceeded in the adit discharge.
- The discharge flowed over the waste rock at the site and was the source of water in Squaw Creek. No observed releases were documented due to the lack of an upstream sample; however, downstream sediment data was more than three times background soil data for manganese, lead, and zinc. Exceedances of drinking water standards were documented in Squaw Creek for cadmium, copper, nickel, and antimony. Aquatic life criteria for lead, mercury, cadmium, copper, lead, and zinc (chronic) and cadmium, copper, and zinc (acute) were exceeded downstream in Squaw Creek. No seeps or springs were observed.
- One hazardous opening existed on-site: the glory hole on the hilltop above the adit had dangerously steep sides and the DSL erected fence was down in several places.

**Silver Dyke Adit PA# 07-135**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/01/93**

**SOLID MATRIX ANALYSES**

FIELD ID	Results per dry weight basis										
	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)
07-135-SE-2	105	164	50.4	11.2	10.3	1500	36500	0.28	1680	13.8	15000
07-135-SE-3	33.9	70.7	5.4	11.2	17.5	933	23700	0.062	2230	17	2460
07-135-SE-4	31.4	49.5	9.5	14.6	14.2	875	24200	0.062 U	1920	14.9	1960
07-135-WR-1	124	198	72.7	6.9	10.6	3330	60300	1.35	1460	12.3	31800
07-135-WR-2	217	237	48.6	19	11.2	2530	80900	0.66	4040	29.6	16400
BACKGROUND	10.5	131	1.4	6.83	22.2	26.1	20600	0.048 U	607	15.6	667

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	SULFUR %	ACID BASE	NEUTRAL POTENT.	ACID BASE POTENT.	SULFUR %	ACID BASE	NEUTRAL POTENT.	ACID BASE POTENT.	SULFUR %	ACID BASE	NEUTRAL POTENT.	ACID BASE POTENT.	SULFUR %	ACID BASE	NEUTRAL POTENT.	ACID BASE POTENT.
07-135-WR1	1.98	61.9	-0.4	-62	0.94	0.14	0.94	0.81	4.37	6.87	-4.78	-5.84				
07-135-WR2	1.97	61.5	1.04	-61	0.81	0.22	0.81	0.81	6.87	6.87	-4.78	-5.84				

**WATER MATRIX ANALYSES**

FIELD ID	Results in ug/L											HARDNESS	
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn
07-135-GW-1	2.5	29.3	2.55 U	5.99 U	5 U	12.3	173 J	0.150	75.9 JX	8.78 U	5.24 J	18.3 U	497
07-135-GW-2	2.84	29.4	2.55 U	5.99 U	5 U	25.3	308 J	0.079	204 JX	8.78 U	4.76 J	18.3 U	1350
07-135-SW-1	4.88	2.24 U	986 J	260	22.7	8950	37400 J	0.150	128000 JX	878	826 J	194	148000
07-135-SW-2	7.12	10.6	838 J	208	18	9440	21900 J	0.120	109000 JX	738	1400 J	147	120000
07-135-SW-3	4.37	16.2	339 J	69	5 U	4220	1540 J	0.140	43100 JX	310	568 J	40.6	56900
07-135-SW-4	4.79	21.5	223 J	46	5 U	2700	1290 J	0.160	26000 JX	201	343 J	37	36800

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

Field ID	TOTAL DISSOLVED SOLIDS				CHLORIDE				SULFATE				NO3/NO2-N				CYANIDE			
	130	<	5.0	49	51	0.27	0.26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-GW-1	130	<	5.0	49	51	0.27	0.26	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-GW-2	137	<	5.0	51	1710	0.1	0.08	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-SW-1	2720	<	5.0	1410	642	<	0.05	0.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-SW-2	2280	<	5.0	1410	642	<	0.05	0.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-SW-3	1040	<	5.0	642	468	<	0.1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
07-135-SW-4	732	<	5.0	468																

**LEGEND**

- SE2 - 150 feet below base of waste rock dump 2.
- SE3 - At road crossing below residence (40' UP).
- SE4 - Squaw Creek above Savage Mill and Carpenter Creek.
- WR1 - Composite of subsamples WR1A, 1B, and 1C.
- WR2 - Composite of subsamples WR2A through 2E.
- BACKGROUND - 280' West of waste rock dump 1, from the Silver Dyke Adit (07-135-SW-1).
- GW1 - Glen Hawthorne residence.
- GW2 - Duplicate of sample 07-135-GW1.
- SW1 - Adit discharge.
- SW2 - Same as sample SE2.
- SW3 - Same as sample SE3.
- SW4 - Same as sample SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Silver Dyke Tailings</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 15</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Tailings from Hardrock mining and milling/Ag, Pb, Zn</u>
Latitude: <u>N 46° 58' 32"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 41' 43"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>May 26, 1993</u>
Inspectors: <u>Tuesday, Belanger, Flammang, Clark, Lasher/Pierson</u>	P.A. # <u>07-137</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of mill tailings remaining at this site was estimated at 56,350 cubic yards; an unknown volume of tailings, formerly at the site, had been deposited in the Carpenter Creek floodplain following a catastrophic failure of the tailings dam. The following elements were elevated at least three times ground (on-site tailings):

Arsenic: 48.1 to 64.5 mg/kg	Barium: 836J to 1,040J mg/kg
Cadmium: 6.7JX to 8.1JX mg/kg	Copper: 1,140 to 5,510 mg/kg
Manganese: 2,120J mg/kg	Lead: 2,920 to 14,200 mg/kg
- The tailings were uncontained, the dam was washed away during the failure. Tailings were actively eroding into a small tributary that bisected the tailings and discharged to Carpenter Creek. The tailings were unvegetated. Tailings materials were observed in the Carpenter Creek floodplain downstream from the site.
- No waste rock was associated with this site, though one of the tailings piles consists of small rock fragments of uniform size (1/2").
- An observed release to surface water for arsenic, barium, cadmium, copper, manganese, and lead was documented with sediment samples, and for copper, manganese, and lead in water samples. No exceedances of drinking water standards were documented. Aquatic life criteria exceedances for copper, lead, and zinc (acute) and mercury, copper, lead, and zinc (chronic) were documented at this site.
- No discharging adits, springs or seeps were found at the site.
- No hazardous structures or openings existed at the site. Potentially hazardous highwalls existed within the tailings due to the dam failure and subsequent undercut banks.

**Silver Dyke Tailings PA# 07-137**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/28/93**

**SOLID MATRIX ANALYSES**

**Metals in soils Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-137-SE-1	17.7	67.3 J	4.4 JX	18.2 J	28.3	63.5	26400	0.023	855 J	26.4 J	586 J	3.1 UJ	712 J	NR
07-137-SE-2	55.9	469 J	13.0 JX	10.5 J	14.3	6440	37300	0.034	2950 J	26 J	7440 J	3.34 UJ	1430 J	NR
07-137-SE-3	14.1	79.1 J	1.5 JX	16.5 J	31.5	55.8	21300	0.024	317 J	23.3 J	145 J	4.43 UJ	237 J	NR
07-137-SE-4	70.9	724 J	14.7 JX	12.8 J	45.2	3680	45500	0.074	2670 J	48.6 J	7730 J	4.36 UJ	1670 J	NR
07-137-TP-1	48.1	836 J	8.1 JX	4.15 J	11.9	4200	36800	0.057	1080 J	12.1 J	8620 J	2.96 UJ	816 J	NR
07-137-TP-2	64.5	1040 J	6.7 JX	7.49 J	20.7	5510	45000	0.067	2120 J	17.1 J	14200 J	3.51 UJ	798 J	NR
07-137-TP-6	54.2	254 J	6.7 JX	8.55 J	12.5	1140	31300	0.052	1560 J	16 J	2920 J	3.01 UJ	838 J	NR
BACKGROUND	10.5	131	1.4	6.83	22.2	26.1	20800	0.048 U	607	15.6	667	3.39 UJ	548	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000	NEUTRAL. POTENT. v/1000	POTENT. v/1000	SULFATE %	SULFATE %	SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	ACID BASE v/1000	ACID BASE v/1000	POTENT. v/1000	POTENT. v/1000
07-137-TP1	0.46	14.4	6.20	-8.17	0.16	0.08	0.22	2.50	0.22	0.08	2.50	3.71		
07-137-TP2	0.26	8.12	8.34	0.27	0.14	0.04	0.08	1.25	0.08	0.04	1.25	7.14		
07-137-TP6	1.09	34.1	8.64	-25.4	<0.01	0.59	0.50	18.4	0.50		18.4	-9.79		

**WATER MATRIX ANALYSES**

**Metals in Water Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-137-SW-1	1.49 U	9.4	2.55 U	5.99 U	9.03 J	1.35 U	20.1	0.15 J	2.6 U	8.78 U	1 U	18.3 U	20 J	26.8
07-137-SW-2	1.49 U	24.2	2.55 U	5.99 U	12.5 J	24.2	85.4	0.17 J	15.8 J	8.78 U	32.2 J	18.3 U	80.5 J	36.5
07-137-SW-3	1.49 U	10.2	2.55 U	5.99 U	12.3 J	1.35 U	45.2	0.29 J	2.6 U	8.78 U	1.2 J	18.3 U	6 U	23.1
07-137-SW-4	1.49 U	11.4	2.55 U	5.99 U	6.43 J	3.8	62.8	0.15 J	4.37 J	8.78 U	8.36 J	18.3 U	9.9 J	23.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-137-SW1	62	< 5.0	8	< 0.05	NR
07-137-SW2	68	< 5.0	15	< 0.05	NR
07-137-SW3	47	< 5.0	< 5.0	< 0.05	NR
07-137-SW4	54	< 5.0	< 5.0	0.08	NR

**LEGEND**

- SE1 - On unnamed tributary above site.
- SE2 - On unnamed tributary at PPE above road.
- SE3 - On Carpenter Creek above tailings site.
- SE4 - On Carpenter Creek, 350' above confluence with Squaw Creek.
- TP1 - Composite of holes 2A and 3B (estimated to be middle of existing pile).
- TP2 - Composite of holes 2C and 3C (estimated to be lower portion of pile).
- TP6 - Composite of holes on upper most pile closest to mill.
- BACKGROUND - From Silver Dyke Add (07-135-S5-1).
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Same as sample SE3.
- SW4 - Same as sample SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Silver Dyke Mill  
Legal Description: T 14N R 8E  
Mining District: Neihart  
Latitude: N 46° 58' 42"  
Longitude: W 110° 41' 55"  
Land Status: Private  
Quad: Neihart  
Inspectors: Tuesday, Belanger, Flammang,  
Lasher, Clark / Pierson  
Organization: Pioneer Technical Services,  
Inc./ Thomas, Dean and Hoskins, Inc.

County: Cascade  
Section(s): NE 1/4, NW 1/4, Sec. 15  
Mine Type: Hardrock / Ag, Pb, Zn  
Primary Drainage: Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Squaw Creek  
Date Investigated: May 25, 1993  
P.A. # 07-138

- There were no mill tailings at this site. Tailings from this mill were transported to the east and were inventoried under the Silver Dyke Tailings, PA# 07-137
- The volume of waste rock associated with this site was estimated to be 82,600 cubic yards. The following elements were elevated at least three times background:

Arsenic: 69.8 to 182 mg/kg	Barium: 450J mg/kg
Cadmium: 12.7JX to 40.8JX mg/kg	Copper: 2,120 to 3,730 mg/kg
Mercury: 0.291 to 0.366 mg/kg	Manganese: 3,610J to 5,050J mg/kg
Lead: 4,830 to 4,380 mg/kg	Zinc: 1,510 to 4,380 mg/kg
- The waste rock dumps were unvegetated and contained abundant sulfides.
- No discharging adits, springs or seeps were observed.
- Two large ore bins were collapsing and the mill building (with machinery) had mostly collapsed; all three were hazardous structures. Asbestos may have be present associated with old bearings and rollers or with insulation.

Silver Dyke Mill PA# 07-138  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-138-TP-1	69.8	104 J	12.7 JX	13.4 J	12.1	2120	41700	0.024	5050 J	40.9 J	4830 J	3.03 UJ	1510 J	NR
07-138-WR-1	182	289 J	17.3 JX	7.88 J	13	2140	58900	0.366	996 J	13.4 J	8430 J	3.21 UJ	2300 J	NR
07-138-WR-2	111	450 J	40.8 JX	11.6 J	7.57	3730	39200	0.291	3610 J	28.2 J	8220 J	3.17 UJ	4380 J	NR
BACKGROUND	10.5	131	1.4	6.83	22.2	28.1	20800	0.048 U	607	15.6	667	3.39 UJ	548	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
07-138-TP1	1.26	39.4	17.9	-21.5	<0.01	0.47	0.80	14.7	3.20
07-138-WR1	3.08	96.2	-18.8	-115	1.61	0.41	1.06	12.8	-31.7
07-138-WR2	2.17	67.8	19.1	-48.7	0.60	0.67	0.90	20.9	-1.84

LEGEND

TP1 - Composite of subsamples TP1A, 1B, 1C, 2A, 2B, and 2C.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Composite of subsamples WR2A, 2B, 2C, 3A, 3B, and 3C.  
BACKGROUND - From the Silver Dyke Adit (07-138-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Sherman No. 2 (Southwest)</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 15</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Pb, Zn, Cu</u>
Latitude: <u>N 46° 58' 23"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 41' 56"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>BurgCreek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>May 26, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark, Lasher/Pierson</u>	P.A. # <u>07-142</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 200 cubic yards. The following elements were elevated at least three times background (using XRF data):

Iron: 66,590 mg/kg	Manganese: 2,946 to 5,792 mg/kg
Lead: 8,605 mg/kg	Zinc: 3,862 to 4,760 mg/kg
- There was a very small discharge (<1gpm) from the adit which may have been seepage from adjacent Burg Creek. The discharge had a pH of 7.1 and SC of 110 us/cm. No other seeps or springs were observed.
- Tailings were in the Carpenter Creek floodplain below this site, but were from upstream dam failure at Silver Dyke Tailings site.
- No observed releases or exceedences of drinking water standards or aquatic life criteria were documented during this investigation; no surface water samples were collected.
- One mine opening was onsite, a partially caved adit that was accessible. A hazardous loadout structure was also at the site.





**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Emma</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>NW 1/4, NW 1/4, Section 15</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Pb, Zn, Ag</u>
Latitude: <u>N 46° 58' 43"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 04"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Squaw Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 6, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>07-144</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
  
- The volume of waste rock observed at the site was estimated to be 520 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 16.2J mg/kg	Manganese: 2,430J mg/kg
Arsenic: 35.9 mg/kg	Lead: 8,460JX mg/kg
Cadmium: 52.2JX mg/kg	Antimony: 20.2J mg/kg
Copper: 1,210J mg/kg	Zinc: 14,200 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
  
- Squaw Creek flows through the center of the site. Observed releases to Squaw Creek (sediment) were documented for arsenic and copper.
  
- MCLs for cadmium, copper, nickel, and antimony, as well as the EPA action level for lead, were exceeded in Squaw Creek both upstream and downstream from the site. Flow in Squaw Creek originates at the discharge from the Silver Dyke Adit (07-135). Additionally, acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in Squaw Creek both upstream and downstream from the site.
  
- Potential safety hazards observed at the site included a collapsing loadout structure and an unstable slope located above a caved adit.

Emma PA# 07-144  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/06/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-144-SE1	53.5 J	36.0	67.6	26.0 JX	28.3 J	19.3 J	3510 J	36000	0.03 U	3070 J	9.5	2240 JX	8.9 J	6390	NR
07-144-SE2	12.3 J	29.5	101	20.7 JX	20.1 J	14.8 J	1050 J	28400	0.04 U	2750 J	8.6	2910 JX	7.6 J	4350	NR
07-144-WR1	16.2 J	35.9	42.3	52.2 JX	24.4 J	11.4 J	1210 J	47800	0.04	2430 J	14.6	8460 JX	20.2 J	14200	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT		SULFUR ACID BASE POTENT	
	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000
07-144-WR1	4.04	126	11.3	-115	<0.01	2.39	2.96	74.7	-63.3							

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-144-SW1	0.73	1.1 U	20.6	397	96.1	4.7 UX	4370	4220	0.11 U	49900	145	618	112 J	59800	594
07-144-SW2	0.92	1.1 U	21.9	447	105	8.6 JX	4980	5180	0.11 U	58000	170	703	131 J	67600	655

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-144-SW1	1180	<5	737	0.23	NR
07-144-SW2	1320	<5	859	0.22	NR

LEGEND

SE1 - Square Creek; 80' below forest dump.  
SE2 - Square Creek; 40' above machinery, below road.  
WR1 - Composite of subsamples WR1B and WR2.  
BACKGROUND - From the Ripple Mine (07-143-SE1).

SW1 - Same as sample 07-144-SE1.  
SW2 - Same as sample 07-144-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Big Seven</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Zn</u>
Latitude: <u>N 46° 56' 55"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 15"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Snow Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>May 27, 1993</u>
Inspectors: <u>Tuesday, Flammang, Lasher,</u>	P.A. # <u>07-156</u>
<u>Clark, Belanger / Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- The mill tailings associated with this site were impounded in one pond (TP-3) and 2 piles (TP-1 and -2). They were in the floodplain of a small tributary of Snow Creek and extended at least 1,000 feet downstream from the site. The volume of these tailings was estimated at 2,580 cubic yards and were 40% revegetated (naturally). The following elements were elevated at least three times background:

Arsenic: 121 to 212 mg/kg	Cadmium: 9.5 to 13.5JX mg/kg
Mercury: 0.071 mg/kg	Manganese: 2,710 to 6,860 mg/kg
Antimony: 15.2 mg/kg	Zinc: 2,430 to 2,740 mg/kg
- The volume of waste rock associated with this site was estimated to be 25,800 cubic yards. The following elements were elevated at least three times background:

Arsenic: 246 to 381 mg/kg	Cadmium: 2.0 to 10.2 mg/kg
Manganese: 1,280 mg/kg	Lead: 2,880 mg/kg
Zinc: 2,200 mg/kg	
- An observed release to surface water (tributary of Snow Creek) was documented in sediments for mercury and manganese, and in water samples for zinc and manganese. Exceedances of drinking water standards were recorded for cadmium; and aquatic life criteria for mercury, cadmium, lead, and zinc (chronic), cadmium and zinc (acute) were documented in surface water at the Big Seven site.
- One discharging adit had a significant flow (0.06 cfs) with significant iron staining 1,000 feet downstream. The adit water (SW-3) had a pH of 6.63, an specific conductance of 500 us/cm, and exceeded drinking water standards for cadmium and nickel; aquatic life criteria for mercury, cadmium, lead, and zinc (chronic), and cadmium and zinc (acute) were also exceeded in the adit discharge.
- Several buildings were at the site, but most appeared in fair condition. There were two open adits at the site.

**Big Seven PA# 07-156**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 05/27/93**

**SOLID MATRIX ANALYSES**

Results per dry weight basis (mg/kg)

Metals in soils

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
07-156-SE-1	242	161	11.1	19.4	13.4	73.2	37800	0.017 U	2870	36.8	518	14.1 J	2900	NR
07-156-SE-4	10.7	175	0.4 U	20.6	138	48	38400	0.016 U	863	67.4	111	5.12 J	312	NR
07-156-SE-5	124	715 J	22.3 J	42.1 J	31.7 J	98.9	39000	0.129	18300	147	887	5.94 UJ	4150	NR
07-156-TP-2	212	365 J	13.5 JX	7.32 J	13.3	55.7	27100	0.071	4140 J	36 J	2510 J	3.03 UJ	2740 J	NR
07-156-TP-3A	121	174	9.5	3.27	18.1	47.2	17900	0.016 U	2710	20.4	434	9.51 J	2430	NR
07-156-TP-3B	126	139	9.7	7.48	30.3	52.1	29700	0.017 U	6860	47.6	576	15.2 J	2530	1.279 U
07-156-WR-1	381	97.2	2.0	14.8	22.8	56.8	55100	0.014 U	1280	17.2	506	5.29 J	785	NR
07-156-WR-2	288	118	1.0	1.4	11	76	33000	0.014 U	146	3.67	2880	9.94 J	631	NR
07-156-WR-3	246	164	0.5 U	1.71	17.6	39.2	32700	0.016 U	71.2	5.1	956	7.02 J	368	NR
07-156-WR-4	265	62.3	10.2	1.22 U	8.97	53.8	30900	0.014 U	47.8	4.96	1220	11.2 J	2200	NR
BACKGROUND	15.1	166	0.6 U	6.73	25.1	28.3	26600	0.02 U	422	16.5	420	4.33 UJ	336	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE U/1000	NEUTRAL POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000	SULFATE %	PYRITIC %	ORGANIC %	PYRITIC ACID BASE U/1000	SULFUR ACID BASE POTENT. U/1000
07-156-SL1	0.03	0.94	-0.33	-1.27	0.02	<0.01	0.01	0.00	-0.33
07-156-TP3A	0.48	15.0	12.9	-2.11	0.05	0.25	0.18	7.81	5.08
07-156-TP3B	0.74	23.1	21.4	-1.14	0.02	0.44	0.28	13.7	8.19
07-156-TP-2	1.19	35.9	37.3	1.38	0.18	0.46	0.51	14.4	22.9
07-156-WR1	2.05	64	-3.97	-88	1.98	0.01	0.06	0.31	-4.28
07-156-WR2	1.56	48.7	-2.06	-50.8	1.51	<0.01	0.05	0.00	-2.06
07-156-WR3	0.83	25.9	-3.37	-29.3	0.8	<0.01	0.03	0.00	-3.37
07-156-WR-4	0.46	14.4	0.33	-14.0	0.45	<0.01	0.01	0.00	0.33
07-156-TP3BDUP	0.76	23.7	21.4	-2.31	0.02	0.45	0.29	14.1	7.37

**WATER MATRIX ANALYSES**

Results in ug/L

Metals in Water

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
07-156-SW-1	1.5 J	8.73	5	6.47	5.7 J	9.17	643	0.3 J	2790 J	38.7	6.17 J	18.3 U	1910 J
07-156-SW-2	2.38 J	18.3	10.2	5.99 U	5 U	12.2	20.1	0.18 J	590 J	13.6	2.25 J	18.3 U	1230 J
07-156-SW-3	2.84 J	11.1	13.9	45	5 U	34.8	11400	0.13 J	14500 J	169	8.16 J	18.3 U	6810 J
07-156-SW-4	1.55 J	24.7	8.17	5.99 U	5 U	10.5	238	0.21 J	2080 J	83.8	3.33 J	18.3 U	4990 J
07-156-SW-5	1.49 U	2.24 U	2.55 U	5.99 U	5.17 J	3.67	13.5 U	0.1 J	4.4 J	8.78 U	1 U	18.3 U	6 U

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

Results in mg/l

FIELD ID	TDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-156-SW1	135	< 5.0	84	0.11	NR
07-156-SW2	69	< 5.0	37	< 0.05	NR
07-156-SW3	328	< 5.0	213	< 0.05	NR
07-156-SW4	377	< 5.0	240	0.12	NR
07-156-SW5	18	< 5.0	< 5.0	< 0.05	NR

**LEGEND**

- TP2 - Sample of the TP2 subsample.
- TP3A - Sample of the TP3A subsample.
- TP3B - Sample of the TP3B subsample.
- WR1 - Composite of subsamples WR1A, 1B, and 1C.
- WR2 - Composite of WR2A, 2B, and 2C.
- WR3 - Composite of subsamples WR3A, 3B, and 3C.
- WR4 - Composite of subsamples WR4A, 4B, and 4C.
- SE1 - At junction of two streams below mine.
- SE4 - Below final impoundment from wood culvert.
- SE5 - Below site but before confluence with Snow Creek.
- SW1 - Above tailings.
- SW2 - Below waste rock dump 3.
- SW3 - Adit #1 discharge.
- SW4 - Same as sample SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Rebellion (Upper &amp; Lower)</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, NW 1/4, Section 27:</u>
Mining District: <u>Neihart</u>	<u>NW 1/4, NW 1/4, Section 27</u>
Latitude: <u>N 46° 56' 53"; N 46° 57' 00"</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Zn</u>
Longitude: <u>W 110° 42' 13"; W 110° 42' 00"</u>	Primary Drainage: <u>Belt Creek</u>
Land Status: <u>Private</u>	USGS Code: <u>10030105</u>
Quad: <u>Neihart</u>	Secondary Drainage: <u>Snow Creek</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	Date Investigated: <u>June 9, 1994</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>07-157 &amp; 07-158</u>

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 64,920 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 7.9J to 98.7J mg/kg	Mercury: 0.34 to 0.48 mg/kg
Arsenic: 53.9 to 181 mg/kg	Lead: 713JX to 3,090JX mg/kg
Barium: 345 to 401 mg/kg	Manganese: 7090J mg/kg
Cadmium: 10.1JX to 12.8JX mg/kg	Zinc: 536 to 2,950 mg/kg
Copper: 64.0J to 117J mg/kg	
- Three discharging adits were associated with the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in all three adit discharges. The EPA action level for lead, as well as the acute and chronic aquatic life criteria for lead, were exceeded in the two adit discharges associated with the upper portion of the Rebellion Mine.
- The three adit discharges eventually merged to form the headwaters of a tributary to Snow Creek. A surface water sample was collected from this tributary downstream from the site. The MCL and the acute and chronic aquatic life criteria for cadmium were exceeded in the sample. Additionally, the acute and chronic aquatic life criteria for copper and zinc and the chronic aquatic life criteria for lead were exceeded in the sample.
- Potential safety hazards observed the site included several collapsing structures (two loadout structures and two collapsing sheds).

Rebellion (Upper & Lower) PA# 07-157 & 07-158  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/09/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-157-WR1	87.9 J	181	401	10.1 JX	6.37 J	4.86 J	64.0 J	22900	0.48	7090 J	7.6	2380 JX	9.4	2040	NR
07-157-WR2	98.7 J	155	345	12.8 JX	5.18 J	5.89 J	117 J	36300	0.34	1920 J	5.5	3090 JX	11.4	2950	NR
07-158-WR1	7.9 J	53.9	29.5	3.71 JX	10.8 J	8.92 J	71.4 J	24000	0.42	1990 J	15.1	713 JX	4.7 UJ	536	NR
BACKGROUND	0.5	9.8	87.8	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
07-157-WR1	1.20	37.5	39.0	1.48	0.26	0.26	0.59	0.35	18.4	20.5								
07-157-WR2	0.49	15.3	3.24	-12	0.34	0.02	0.02	0.13	0.62	2.62								
07-158-WR1	0.52	16.2	3.71	-13	0.28	0.08	0.18		2.50	1.21								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-157-AD1	4.42	15.4	15.1	68.5	16.4	7.1 JX	263	6880	0.11 U	10200	45.5	221	29.4 U	10200	113
07-157-AD2	4.23	12.5	15.0	68.1	16.7	5.5 JX	263	5880	0.11 U	10300	40.8	235	29.4 U	10400	115
07-158-AD1	1.12	1.1 U	12.2	22.9	11.7	4.7 UX	45.6	1780	0.11 U	9140	29.8	53.5	29.4 U	4730	124
07-158-SW1	1.13	1.1 U	12.5	42.0	8.7 U	4.7 UX	97.2	25.0	0.11 U	7960	38.9	19.1	29.4 U	7450	116

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-157-AD1	284	<5	166	<0.05	NR
07-157-AD2	271	<5	168	0.25	NR
07-158-AD1	233	<5	141	<0.05	NR
07-158-SW1	243	<5	142	<0.05	NR

LEGEND

07-157-WR1 - Composite of subsamples WR1 through WR3.  
07-157-WR2 - Composite of subsamples WR1A through 4C and 5.  
07-158-WR1 - Composite of subsamples WR1A through 1D.  
BACKGROUND - From the Eagle Mine (07-103-081).

07-157-AD1 - Acid discharge at base of WR4, near WR3.  
07-157-AD2 - Acid discharge at base of WR4 below old building.  
07-158-AD1 - Acid discharge from the covered old building at Lower B.  
07-158-SW1 - Deviations from Lower B. Substation site in unmined job.  
of Shove Creek.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Ripple Mines</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>NE 1/4, SW 1/4, Section 27</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Au. Pb. Zn</u>
Latitude: <u>N 46° 56' 43"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 41' 52"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 7, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>07-163</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 6,100 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 77J to 105J mg/kg	Copper: 89.3J to 184J mg/kg
Arsenic: 391 to 687 mg/kg	Mercury: 0.83 to 1.12 mg/kg
Barium: 459 mg/kg	Lead: 6,270JX to 6,920JX mg/kg
Cadmium: 8.47 JX mg/kg	Zinc: 515 to 1,670 mg/kg
- There were four discharging adits observed at the site during the investigation; however, none of the flows reached a flowing surface water source. The MCLs for arsenic and cadmium were exceeded in the Adit #1A discharge; and the MCL for cadmium was exceeded in the Adit #3 discharge. The acute and chronic aquatic life criteria for zinc were exceeded in all four discharges; and the acute and chronic aquatic life criteria for cadmium and copper were exceeded in all discharges except Adit #2. Additionally, the chronic aquatic life criteria for lead was exceeded in all of the discharges.
- The surface water sample collected below the site exceeded the MCL for cadmium. The acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc, as well as the chronic aquatic life criteria for iron.
- Potential safety hazards observed at the site included three open adits, a collapsing loadout structure, and a collapsing cabin.

Ripple Mines PA# 07-163  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/07/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-163-WR1	105 J	687	156	8.47 JX	1.8 UJ	1.31	89.3 J	34400	1.12	396 J	5.5	6920 JX	13.5 J	1670	NR
07-163-WR3	77 J	391	459	2.83 JX	1.4 UJ	1.21	184 J	25300	0.83	163 J	1.32 U	6270 JX	4.9 UJ	515	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	ACID BASE POTENT. v/1000t	SULFATE %	SULFUR %	SULFUR %	ACID BASE v/1000t	ACID BASE v/1000t	ACID BASE v/1000t	POTENT. v/1000t	SULFUR
07-163-WR1	1.09	34.1	0.37	-34	0.82	0.09	0.38	2.81	0.62	-2.44		
07-163-WR3	1.28	40.0	-1.14	-41	1.17	0.02	0.09			-1.77		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-163-AD1A	0.15	115	22.6	30.6	9.8	4.7 UX	175	15500	0.11 U	5500	17.3	5.4	29.4 U	5530	47.9
07-163-AD1B	1.00	1.9	7.5	3.1	8.7 U	4.7 UX	36.9	765	0.11 U	431	8.0 U	42.0	29.4 U	505	31.6
07-163-AD2	0.27	3.1	10.3	2.6 U	8.7 U	11.3 JX	4.6 U	653	0.11 U	29.9	8.0 U	4.0	29.4 U	55.4	21.8
07-163-AD3	0.89	1.1	31.3	8.0	8.7 U	4.7 UX	73.5	665	0.11 U	1030	8.0 U	50.1	29.4 U	882	23.6
07-163-SW1	0.35	24.8	15.2	14.3	8.7 U	4.7 UX	103	3530	0.11 U	3180	8.0 U	33.4	29.4 U	3220	39.9

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-163-AD1A	138	<5	86	0.11	NR
07-163-AD1B	78	<5	22	0.16	NR
07-163-AD2	52	<5	6.0	0.14	NR
07-163-AD3	55	<5	22	0.26	NR
07-163-SW1	132	<5	61	0.18	NR

LEGEND

WRL - Composite of subsamples WRL1A through ID.  
WRL2 - Composite of subsamples WRL1A and 1B.  
BACKGROUND - From the Ripple Mines (07-163-SW1).

AD1A - Discharge from silt associated with WRL1A.  
AD1B - Discharge from silt associated with WRL1B.  
AD2 - Discharge from silt associated with WRL2.  
AD3 - Discharge from silt associated with WRL3.  
SW1 - At confluence of Adits #1A and #1B discharges on dump WRL1A.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lexington No. 4</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, NE 1/4, Section 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Pb. Au</u>
Latitude: <u>N 46° 56' 50"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 35"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>June 9, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>07-167</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 6,600 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 18.9J mg/kg	Mercury: 0.19 mg/kg
Arsenic: 316 mg/kg	Lead: 2,410 mg/kg
Cadmium: 10.8JX mg/kg	Zinc: 2,850 mg/kg
Copper: 46.8J mg/kg	
- One discharging adit was observed at the site during the investigation; however, the adit did not reach a surface water source. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc were exceeded in the adit discharge.
- Potential safety hazards observed at the site included a collapsing shed and several unstable, steep slopes associated with the waste rock dumps and caved adit.

Lexington No. 4 PA# 07-167  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/09/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-167-WR1	18.9 J	316	37.3	10.8 JX	5.35	7.31 J	46.8 J	36400	0.19	1170 J	8.7	2410 JX	6.8	2850	NR
BACKGROUND	0.5	9.6	87.6	1.32 JX	9.05 J	27.2 J	10.8 J	21100	0.04	708 J	10.3	52.4 JX	4.7 UJ	135	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE v/1000t	SULFUR ACID BASE POTENT. v/1000t
07-167-WR1	1.51	47.2	8.95	-38	0.86	0.40	0.25	7.81	1.14

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Ca	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-167-AD1	0.33	18.5	2.1	9.1	8.7 U	4.7 UX	23.1	2900	0.11 U	1770	8.0 U	96.8	29.4 U	1840	48.4
07-167-SW1	0.12 U	1.1 U	5.7	5.4	8.7 U	4.7 UX	4.6 U	36.4	0.11 U	234	8.0 U	4.5	29.4 U	1090	37.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-167-AD1	96	<5	34	0.06	NR
07-167-SW1	73	<5	35	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR2A, 2B, 2C, and 2D.  
BACKGROUND - From the Ripple Mine (07-163-001).

AD1 - Lexington #4 Ash discharge.  
SW1 - Ash discharge before dump and across road.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Champion</u>	County: <u>Deerlodge</u>
Legal Description: <u>T 6N R 8W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 33</u>
Mining District: <u>Orofino</u>	Mine Type: <u>Hardrock/Ag</u>
Latitude: <u>N 46° 13' 55"</u>	Primary Drainage: <u>Orofino Creek</u>
Longitude: <u>W 112° 36' 40"</u>	USGS Code: <u>12010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Orofino Creek</u>
Quad: <u>Lockhart Meadows</u>	Date Investigated: <u>July 16, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>12-003</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 5,700 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 74 mg/kg                      Mercury: 0.869 mg/kg  
Chromium: 39.5 mg/kg                  Lead: 37 mg/kg
- The volume of waste rock associated with this site was estimated to be 6,500 cubic yards. There were no elements found to be elevated greater than three times background.
- There was one discharging adit identified at this site. This discharge was characterized by sample GW-1. The flow from the adit was measured at 0.027 cfs, the pH was 5.92, and specific conductance was 540 umhos/cm. The MCL/MCLG for cadmium was exceeded. In addition, the chronic aquatic life criteria for iron was exceeded. A strong hydrogen sulfide odor emanated from the adit.
- There was an unnamed tributary to Orofino Creek identified to be associated with this site. Samples were collected up and down stream from the site and were characterized by samples SW-2 and SW-1, respectively. No MCLs or aquatic life criteria exceedances were attributable to the site. Stream sediment samples were also collected from the unnamed tributary upstream and downstream from the site; observed releases were documented for arsenic and chromium that were directly attributed to this site.
- The ore bin/loadout on WR-2 was classified as a hazard structure.
- There was approximately 100 pounds of asbestos-containing material located at this site, that was scattered around the upper cement foundation east of adit #1.

Champion PA# 12-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
12-003-SE-1	49	175	1.7	71.9	14.5	32.6	25500	0.305	3560	42	24	7 UJ	143	NR
12-003-SE-2	7	67.2	0.6 U	7.2	4.5	8.3	11000	0.142	389	3 U	12	8 UJ	30	NR
12-003-TP-1	74	34	0.7	5.5	39.5	16.3	15700	0.869	238	9	37	7 UJ	33	NR
12-003-WR-1	54	30.4	1	9.5	22.6	39.5	26800	0.297	438	6	21	7 UJ	39	NR
BACKGROUND	24	289	1.6	17.4	7.8	17.2	17600	0.106	1760	5	11	7 UJ	64	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR %	ACID BASE $\mu/1000x$	NEUTRAL POTENT. $\mu/1000x$	ACID BASE POTENT. $\mu/1000x$	SULFUR %	SULFUR %	ACID BASE $\mu/1000x$	SULFUR %	ACID BASE POTENT. $\mu/1000x$	SULFUR %	ACID BASE POTENT. $\mu/1000x$	SULFUR %
12-003-WR-1	0.61	19.1	13.6	-5.5	0.48	0.01	0.12	0.31	13.3			

WATER MATRIX ANALYSES

Metals in Water  
Results in  $\mu g/L$

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
12-003-GW-1	4.68 J	8.47	10.20 J	75.60	6.83 U	1.55 U	62800	0.038 U	11600	55.1	1.04 J	30.7 U	14	500
12-003-SW-1	3.54	41.9	5.67 J	9.7 U	6.83 U	1.6	65	0.038 U	146	12.7 U	1.55 U	30.7 U	7.57 U	110
12-003-SW-2	2.81 J	38.20	2.57 U	9.70 U	6.83 U	1.55 U	11.8	0.038 U	4.08 U	12.7 U	0.83 J	30.7 U	7.57 U	107

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
12-003-GW-1	984	5.3	539	< 0.05	NR
12-003-SW-1	163	< 5.0	35	< 0.05	NR
12-003-SW-2	151	< 5.0	18	< 0.05	NR

LEGEND

- SE1 - 25' from tailings berm, downstream.  
SE2 - Upstream from old cabin and small collapsed edit.  
TPI - Composite of TPIA-A through 1A-C, 1B-A through 1B-C, and 1C-A.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.  
BACKGROUND - From the Champion Mine (12-003-SS-1).
- GW1 - Discharge from edit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Cable Mine</u>	County: <u>Deerlodge</u>
Legal Description: <u>T 5N R 13W</u>	Section(s): <u>SW 1/4, Sec. 10</u>
Mining District: <u>Silver Lake</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Tungsten</u>
Latitude: <u>N 46° 12' 02"</u>	Primary Drainage: <u>Warm Springs Creek</u>
Longitude: <u>W 113° 13' 00"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cable Creek</u>
Quad: <u>Silver Lake</u>	Date Investigated: <u>September 10, 1993</u>
Inspectors: <u>Babits/Pierson</u>	P.A. # <u>12-002</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The site was active. No samples were collected.
- The tailings were piled for reprocessed.
- Most waste rock had already been reprocessed.
- The water from the discharging adit was piped to the reprocessing facility.
- Cable Creek was approximately 0.5 miles from the site. The active mine operation was approximately 1,000 feet from the creek.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Gold Coin  
Legal Description: T 5N R 13W  
Mining District: Silver Lake  
Latitude: N 46° 10' 31"  
Longitude: W 113° 14' 45"  
Land Status: Private  
Quad: Silver Lake  
Inspectors: Tuesday, Belanger, Lasher  
Organization: Pioneer Technical Services Inc.

County: Deerlodge  
Section(s): SE 1/4, NE 1/4, Sec. 20  
Mine Type: Private  
Primary Drainage: Warm Springs Creek  
USGS Code: 17010201  
Secondary Drainage: Daily Gulch  
Date Investigated: June 25, 1993  
P.A. # 12-004

- The volume of tailings associated with this site was estimated to be approximately 9,367 cubic yards. The tailings were partially revegetated naturally. TP-1 was situated directly in a small wetland located near the highway, and TP-3 was situated directly in Daily Lake. Cyanide measurements varied from non-detect to 21.09 mg/kg in the tailings. The following elements were elevated at least three times background:  
Arsenic: 207 to 270 mg/kg                      Antimony: 16 mg/kg  
Iron: 79,700 to 90,100 mg/kg                      Zinc: 309 mg/kg  
Mercury: 0.943J to 1.75J mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 27,200 cubic yards. The following elements were elevated at least three times background:  
Iron: 69,900 mg/kg                      Antimony: 15 mg/kg  
Mercury: 0.729J mg/kg
- There were no flowing adits, filled shafts, seeps, or springs observed at the site during the investigation. A surface water sample was collected from Daily Lake, no MCLs or acute or chronic aquatic life criteria were exceeded. The pH measurement in the lake sample was 8.39.
- One potentially hazardous open adit was observed at the site, all other adits were closed and the shaft was fenced. The mill building was in relatively poor condition and potentially hazardous.

Gold Coin PA# 12-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
12-004-TP-1	270	218 J	0.5 U	3.3	3.7	23.8	79700	1.75 J	392 J	8 J	13	16	80	0.276 U
12-004-TP-3	207	151 J	0.4 U	7.9	10.6	27.9	90100	0.943 J	401 J	12 J	20	6	309	21.1
12-004-WR-1	187	48.1 J	0.4 U	4.9	3.6	33.3	69900	0.729 J	387 J	8 J	21	15	68	NR
BACKGROUND	64	144	0.5 U	7.1	12.1	42.9	12800	0.025 J	597	13	27	5 J	92	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	U/1000	POTENT.	U/1000	POTENT.	U/1000	%	U/1000	%	U/1000	%	U/1000	POTENT.	U/1000
12-004-TP-1	<0.01	0	479	479	479	479	<0.01	0	0.01	0.01	0	0	479	479
12-004-TP-1DUP	<0.01	0	472	472	472	472	<0.01	0	0.01	0.01	0	0	472	472
12-004-TP-3	<0.01	0	172	172	172	172	<0.01	0	0.01	0.01	0	0	172	172
12-004-WR-1	<0.01	0	924	924	924	924	<0.01	0.07	0.05	0.05	2.19	2.19	922	922

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
12-004-SW-1	41.7	60.5	2.57 U	9.7 U	6.83 U	3.2	718	0.038 U	39.2	12.7 U	3.25	30.7 U	7.57 U	181

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
12-004-SW-1	271	< 5.0	117	0.06	NR

LEGEND

SW1 - Daly Lake

TP1 - Composite of subsamples TP1A and 1B.

TP3 - Composite of subsamples 3A-1, 3A-2, 3A-3, and 3A-4.

WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.

BACKGROUND - From the Silver Lake Millsite (12-070-SS-1).

TP1DUP - Duplicate of sample 12-004-TP-1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Silver Lake Millsite</u>	County: <u>Deerlodge</u>
Legal Description: T <u>5N</u> R <u>13W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 21</u>
Mining District: <u>Silver Lake</u>	Mine Type: <u>Mill/Wulferlite, Scheelite</u>
Latitude: <u>N 46° 09' 59"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 14' 22"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage:
Quad: <u>Silver Lake</u>	Date Investigated: <u>June 25, 1993</u>
Inspectors: <u>Bullock, Flammang, Lasher</u>	P.A. # <u>12-070</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 11,170 cubic yards. The following elements were elevated at least three times background:  
Mercury: 0.133J to 0.275J mg/kg
- No waste rock was observed at this site during the investigation.
- There were no adit discharges observed at the site during the investigation; however, a pond containing submerged tailings was located on-site. Surface water and sediment samples were collected from the pond. No MCLs or acute or chronic aquatic criteria were exceeded; however, the concentration of mercury in the pond sediment was significantly elevated (greater than three times) above background and was attributable to the site.
- A groundwater sample was collected from a residential well located 250 feet northwest of the site. No MCL/MCLGs were exceeded in this sample.
- Potentially hazardous structures associated with this site included the mill, two sheds, and a trailer.
- Several drums/containers containing petroleum products and unknown materials were located on site, one full 55-gallon barrel of unknown content was in poor condition and at risk of rupturing.

**Silver Lake Millsite PA# 12-070**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/25/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
12-070-SE-1	7	119 J	0.9	4.9	10.5	53.8	8850	0.206 J	157 J	11 J	41	6 U	106	NR
12-070-TP-1	6	68.4 J	1.4	1.7	3.4	37.2	3100	0.275 J	364 J	9 J	67	3 U	109	NR
12-070-TP-2	3 U	127 J	0.5 U	1.2 U	1.2	8.6	786	0.133 J	103 J	5 J	5	4 U	37	NR
BACKGROUND	64	144	0.5 U	7.1	12.1	42.9	12800	0.025 J	597	13	27	5 J	92	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		ACID BASE		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	TOTAL	%	SULFUR	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	%	SULFUR	%	ACID BASE	POTENT.	%	%	ACID BASE	POTENT.	%	%
12-070-TP-1	<0.01		0		855		855		<0.01		<0.01		0.18		<0.01		5.62		849	
12-070-TP-2	<0.01		0		919		919		<0.01		<0.01		0.02		<0.01		0.62		919	

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
12-070-GW-1	0.98 U	18	2.57 U	9.7 U	6.83 U	4.77	11.8 U	0.1	4.4	12.7 U	0.38 U	30.7 U	7.57 U	88.2
12-070-GW-2	1.01	17.4	2.57 U	9.7 U	6.83 U	5.8	11.8 U	0.059	4.08 U	12.7 U	0.59	30.7 U	7.57 U	86.9
12-070-SW-1	2.93	23.5	2.57 U	9.7 U	6.83 U	2.43	79	0.038 U	4.08 U	12.7 U	1.41	30.7 U	7.57 U	87.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
12-070-GW-1	124	< 5.0	9	0.13	< 0.01
12-070-GW-2	137	< 5.0	9	0.12	< 0.01
12-070-SW-1	125	< 5.0	9	< 0.05	< 0.01

**LEGEND**

SE1 - North side of pond near overflow.  
 TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1B-A, 1B-B, and 1B-C.  
 TP2 - Composite of subsamples TP2A and 2B.  
 BACKGROUND - From Silver Lake Millsite (12-070-SS-1).  
 GW1 - Residential well 250' Northwest of site.  
 GW2 - QA duplicate of sample 12-070-GW-1.  
 SW1 - Same as sample SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Gilt Edge Tailings</u>	County: <u>Fergus</u>
Legal Description: <u>T 16N R 20E</u>	Section(s): <u>SW 1/4, SW 1/4, Section 17; SE 1/4, SE 1/4, Section 20</u>
Mining District: <u>Warm Springs</u>	Mine Type: <u>Millsite/Au, Ag, Pb, Cu</u>
Latitude: <u>N 47° 07' 53"</u>	Primary Drainage: <u>Chippewa Creek</u>
Longitude: <u>W 109° 12' 29"</u>	USGS Code: <u>10040204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Ox Frame Gulch/Chippewa Creek</u>
Quad: <u>Judith Peak</u>	Date Investigated: <u>July 14, 1994</u>
Inspectors: <u>Tuesday, Bisch, West</u>	P.A. # <u>14-008</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 69,860 cubic yards. This volume includes a previously reclaimed tailings pond (located near the headwaters of Chippewa Creek at the Gilt Edge Mine), as well as an uncontained tailings pile located near the small community of Gilt Edge (approximately 1.5 miles downstream from the Gilt Edge Mine). The following elements were elevated to at least three times the background concentrations:  
Arsenic: 928J mg/kg  
Antimony: 21.0J to 128J mg/kg  
Mercury: 2.23J mg/kg to 4.50J mg/kg
- A domestic well was sampled in the town of Gilt Edge downgradient of TP-2. No MCLs were exceeded in this groundwater sample.
- The headwaters of Chippewa Creek are located at the Gilt Edge Mine, and the creek flows adjacent to the large, uncontained tailings pile located downstream. Observed releases to Chippewa Creek (sediment) were documented for arsenic and mercury.
- No MCLs were exceeded in Chippewa Creek; however, the chronic aquatic life criteria for mercury was exceeded in the downstream sample. This exceedence was directly attributable to the site.
- Two, potentially hazardous, mine openings (adits) were observed in the mine area. Additional safety hazards at the site included two elevated, large metal vats and a wooden loadout structure located near the lower tailings pile.

**Glitt Edge Tailings PA# 14-008**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 07/14/84**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-008-SE1	1.7 JX	7.5 J	103	0.5 U	3.9	5.2	6.8	7530	0.02 UJ	619	8.9	23.2	5.4 UJ	70.8	NR
14-008-SE2	2.4 JX	147 J	221	0.7 U	9.0	9.9	16.9	15200	1.58 J	340	22.7	25.5	7.7 UJ	169	NR
14-008-SE3	1.8 JX	183 J	247	0.8 U	4.9	6.1	9.7	8900	1.59 J	309	9.0	11.2 U	33.4 J	94.8	NR
14-008-TP1	1.0 JX	389 J	325	0.5 U	3.9	3.7	11.8	10200	2.23 J	283	10.5	35.1 U	21.0 J	96.1	0.628
14-008-TP2	0.5 UX	928 J	257	0.4 U	13.9	11.9	14.8	15400	4.50 J	309	11.0	29.5 U	128 J	148	9.899
BACKGROUND	0.5 UX	131 J	124	0.5 U	7.0	13.4	14.5	17600	0.08 J	467	18.2	19.3	5.3 UJ	65.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE		SULFUR ACID BASE	
	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
14-008-TP1	0.05	1.56	439		438		<0.01		0.03		0.06		0.94		438			
14-008-TP2	0.27	8.43	253		245		0.24		<0.01		0.03		0.00		253			

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
14-008-GW1	0.12 U	2.0	33.8	2.6 U	8.7 U	4.7 U	4.6 U	766	0.08 U	163	8.0 U	2.3	29.4 U	4.5 U	471
14-008-SW2	0.12 U	96.9	141	2.6 U	8.7 U	5.1	4.6 U	363	0.08 U	194	8.0 U	2.5	29.4 U	10.2	385
14-008-SW3	0.12 U	51.5	127	2.6 U	8.7 U	4.7 U	4.6 U	189	0.10	32.6	8.0 U	1.8	29.4 U	4.5 U	419

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
14-008-GW1	NR	NR	NR	<0.05	<0.005
14-008-SW2	423	<5	53	0.09	NR
14-008-SW3	449	<5	89	0.23	NR

**LEGEND**

SE1 - Upstream 400' above TP1.  
 SE2 - Downstream of TP1, up from TP2 in Chippewa Creek.  
 SE3 - Downstream of TP2 in Chippewa Creek.  
 TP1 - Composite of subsamples TP1A and 1B.  
 TP2 - Composite of subsamples TP2A through 2E.  
 BACKGROUND - From the Pioneer John Mine (14-004-SE1).

GW1 - Residential well 1,000' down-gradient from site.  
 SW2 - Same as sample 14-004-SE2.  
 SW3 - Same as sample 14-004-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Tail Holt</u>	County: <u>Fergus</u>
Legal Description: <u>T 17N R 20E</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 30</u>
Mining District: <u>Warm Springs</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 47° 12' 27"</u>	Primary Drainage: <u>Fords Creek</u>
Longitude: <u>W 109° 12' 35"</u>	USGS Code: <u>10040204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Collar Gulch</u>
Quad: <u>Judith Peak</u>	Date Investigated: <u>September 11, 1993</u>
Inspectors: <u>Bullock, S. Babits</u>	P.A. # <u>14-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings positively identified at this site during the investigation. The material constituting WR-2 was well sorted crushed rock that may have been put through an on site milling process
- The volume of waste rock associated with this site was estimated to be approximately 3,800 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 283 mg/kg                      Copper: 61 mg/kg  
Mercury: 0.748J mg/kg
- One adit discharge was observed at the site during the investigation. The adit discharge seeped into WR-1 but did not resurface at the toe of the dump. No MCLs were exceeded in the discharge; however, the acute and chronic aquatic life criteria for copper and the chronic aquatic life criteria for lead and mercury were exceeded. No other surface water was observed on or near the site.
- Potentially hazardous mine openings associated with this site included the adit and the air raise south of the site.

Tail Holt PA# 14-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/11/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-010-WR-1	283	112	0.8 U	9.2	1.43	61	31900	0.748 J	1080	4.17	69.4	5.77 UJ	152	NR
BACKGROUND	31.8	226	0.8 U	6.41	8.08	14.1	20700	0.039 J	3060	12	45.5	5.67 UJ	107	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR	ACID BASE	NEUTRAL POTENT.	SULFUR ACID BASE	SULFATE	PYRITIC	ORGANIC	PYRITIC	SULFUR	ACID BASE	POTENT.	SULFUR
	%	1/1000	1/1000	1/1000	%	%	%	1/1000	%	1/1000	1/1000	1/1000
14-010-WR-1	0.47	14.7	12.5	-2.2	0.09	0.24	0.14	7.5	4.98			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
14-010-GW-1	4.32 JX	31.2	2.57 U	9.7 U	6.83 U	36.4	857	0.14	82.6	12.7 U	6.6	30.7 UJ	38.6	106

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
14-010-GW-1	179	< 5.0	32	0.21	NR

LEGEND

WRI - Composite of subsamples WRI-A, 1B, 1C, and 2.  
BACKGROUND - From Tail Holt (14-010-SS-1).  
GW1 - Acid discharge at portal.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Cumberland</u>	County: <u>Fergus</u>
Legal Description: T <u>16N</u> R <u>20E</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 5</u>
Mining District: <u>Warm Springs</u>	Mine Type: <u>Hardrock/Ag. Au</u>
Latitude: <u>N 47° 10' 58"</u>	Primary Drainage: <u>Maiden Creek</u>
Longitude: <u>W 109° 12' 30"</u>	USGS Code: <u>10040204</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Spotted Horse Creek</u>
Quad: <u>Judith Peak</u>	Date Investigated: <u>September 11, 1993</u>
Inspectors: <u>Bullock, S. Babits</u>	P.A. # <u>14-017</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 1,220 cubic yards. The following elements were elevated at least three times background:

Arsenic: 129 to 601 mg/kg	Nickel: 67.4 mg/kg
Copper: 46 mg/kg	Lead: 163 mg/kg
Mercury: 2.53J to 39.2J mg/kg	Antimony: 17.7J mg/kg
Zinc: 347 to 2,170 mg/kg	
  
- The volume of waste rock associated with this site was estimated to be approximately 2,935 cubic yards. The following elements were elevated at least three times background:

Arsenic: 154 mg/kg	Manganese: 16,600 mg/kg
Cadmium: 5 to 9 mg/kg	Lead: 1,190 to 1,270 mg/kg
Copper: 61.4 to 384 mg/kg	Zinc: 1,090 to 6,450 mg/kg
Mercury: 0.275J mg/kg	
  
- There were no adit discharges, seeps, or springs observed at this site during the investigation.
  
- Spotted Horse Creek flowed directly through the site, and surface water and sediment samples were collected both upstream and downstream from the site. No MCLs were exceeded in either of the samples; however, the chronic aquatic life criteria for mercury was exceeded in both upstream and downstream samples. The chronic aquatic life criteria for lead and iron were exceeded in the upstream sample.
  
- An observed release to Spotted Horse Creek (sediment) was documented for mercury which was directly attributable to the site.
  
- Potentially hazardous mine openings associated with this site included two open adits and a large glory hole with a 100 foot tall highwall.

Cumberland PA# 14-017  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/1/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
14-017-SE-1	78.8	253	1.0 U	2.08	4.55	7.86	13800	0.566 J	305	6.18	53.9	6.85 UJ	208	NR
14-017-SE-2	29.8	157	1.2 U	2.67	3.68	6.5	10100	0.123 J	502	3.6	30.6	8.02 UJ	73.3	NR
14-017-TP-1	129	210	0.8 U	2.65	5.22	7.52	8130	2.53 J	233	14.3	19.6	5.55 UJ	347	2.55
14-017-TP-2	601	627	1.3 U	13.4	22.6	46	33500	39.2 J	1070	67.4	163	17.7 J	2170	1.57
14-017-WR-1	86.9	281	9.5	4.48	0.96 U	61.4	16900	0.275 J	4390	8.61	1270	4.87 UJ	1090	NR
14-017-WR-2	154	49.3	5.2	9.12	15.1	384	56500	0.03 U	16600	31.2	1190	6.4 UJ	6450	NR
BACKGROUND	31.8	226	0.8 U	6.41	8.08	14.1	20700	0.039 J	3060	12	45.5	5.67 UJ	107	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
14-017-TP-1	<0.01	0	317	317	<0.01	0.01	0.01	0.31	317
14-017-TP-1	<0.01	0	321	321	<0.01	0.01	0.01	0.31	320
14-017-TP-2	0.03	0.94	288	287	<0.01	0.02	0.04	0.62	287
14-017-WR-1	1.01	31.6	53.9	22.3	0.05	0.59	0.37	18.4	35.4
14-017-WR-2	0.62	19.4	94	74.6	0.03	0.24	0.35	7.5	86.5

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC. Zn (mg CaCO3/L)
14-017-SW-1	3.08 JX	115	2.57 U	9.7 U	6.83 U	1.7	475	0.2	6.6	12.7 U	2.62	30.7 UJ	17.5	103
14-017-SW-2	2.03 JX	114	2.57 U	9.7 U	6.83 U	2.57	1130	0.18	21.1	12.7 U	2.56	30.7 UJ	15.3	55.5

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
14-017-SW-1	165	< 5.0	9	0.11	< 0.005
14-017-SW-2	128	< 5.0	5	< 0.05	0.008

LEGEND

SE1 - Downstream of lower tailings near Spotted Horse well.  
SE2 - Upstream of pond created by waste rock dump 3 on Spotted Horse well.  
TP1 - Composite of subsamples TP1A-A and 1B.  
TP2 - Sample of subsample TP1A-B.  
WR1 - Composite of subsamples WR1 and 2.  
WR2 - Composite of subsamples 3A and 3B.  
BACKGROUND - From the Trail Holt Mine (14-01C-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Prester John</u>	County: <u>Fergus</u>
Legal Description: T <u>16N</u> R <u>20E</u>	Section(s): <u>S 1/2, SW 1/4, Section 30</u>
Mining District: <u>Warm Springs</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 47° 07' 4.6</u>	Primary Drainage: <u>Chippewa Creek</u>
Longitude: <u>W 109° 14' 30.5</u>	USGS Code: <u>10040204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>South Fork of Chippewa Creek</u>
Quad: <u>Judith Peak/Horsethief Coulee West</u>	Date Investigated: <u>July 15, 1994</u>
Inspectors: <u>Tuesday, Bisch, West</u>	P.A. # <u>14-090</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of mill tailings observed at the site was estimated to be 20,835 cubic yards. The following elements were elevated to at least three times background concentrations:  
Arsenic: 1,430J mg/kg                      Antimony: 45.0J mg/kg  
Barium: 598 mg/kg                          Zinc: 199 mg/kg  
Mercury: 3.26J mg/kg
- The volume of waste rock observed at the site was estimated to be 3,870 cubic yards. The following elements were elevated to at least three times background concentrations:  
Arsenic: 781 mg/kg  
Mercury: 0.98J mg/kg  
Barium: 481 mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- The entire volume of tailings associated with the site are situated directly in an intermittent, unnamed tributary to the south fork of Chippewa Creek (dry during investigation). The tailings extend for more than 1/2-mile downstream along the drainage. Observed releases to the tributary (sediment) were documented for arsenic, mercury, barium, and antimony.
- Potential safety hazards observed at the site included two open adits (previously gated, but subsequently broken into), a fenced shaft, and a relatively large, open pit.

**Prester John PA# 14-090**

**Metals in soils**  
**Results per dry weight basis**

TT - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Recommended

## LEGEND

SULFUR ACID BASE POTENT.	V1000t	345 362
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SS11 - Dry drainage above mine and mill.  
SS22 - Dry drainage 700' below breached dam.  
TP1 - Composite of submaples TP1A through 1D.  
WR1 - Composite of submaples WR1, 2, 3A, and 3B.  
BACKGROUND - From the Printer John Miles (4-990-SS1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Flathead Mine Complex</u>	County: <u>Flathead</u>
Legal Description: T <u>25N</u> R <u>23W</u>	Section(s): <u>Sec. 17 and 18</u>
Mining District: <u>Hog Heaven</u>	Mine Type: <u>Hardrock/Ag. Au. Pb</u>
Latitude: <u>N 47° 55'</u>	Primary Drainage: <u>Sullivan Creek</u>
Longitude: <u>W 114° 34'</u>	USGS Code: <u>17010212</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Sullivan Creek</u>
Quad: <u>Koffard Ridge</u>	Date Investigated: <u>August 5, 1993</u>
Inspectors: <u>Bullock, Tuesday, Belanger,</u>	P.A. # <u>15-012</u>
<u>Fiammang, Clark</u>	
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 455 cubic yards of tailings on site. The following elements were elevated at least three times background:

Arsenic: 160J mg/kg	Cadmium: 12.2 mg/kg
Copper: 348 mg/kg	Mercury: 1.58 mg/kg
Lead: 3,330 mg/kg	Antimony: 130 mg/kg
Zinc: 3,470 mg/kg	
  
- There were approximately 89,980 cubic yards of waste rock on site. The following elements were elevated at least three times background:

Arsenic: 134J to 3,690J mg/kg	Barium: 1,000 to 2,160 mg/kg
Cadmium: 5.94 to 21.3 mg/kg	Copper: 34 to 5,760 mg/kg
Iron: 139,000 mg/kg	Mercury: 0.734 to 6.1 mg/kg
Lead: 1,700 to 21,100 mg/kg	Antimony: 114 to 438 mg/kg
Zinc: 2,030 to 2,070 mg/kg	
  
- There were three discharging adits on site and none directly entered surface water. One adit was sampled as GW-1 and had a flowrate of approximately 1 gpm, a pH 2.83 and a specific conductance of 2410 umhos/cm. Arsenic, cadmium, nickel, and antimony exceeded MCL/MCLGs in this discharge. There was a pipe at the West Flathead Nine that discharged to the creek. This discharge was sampled as GW-2 and had a flowrate of approximately 25 gpm, a pH 5.8, and a specific conductance of 1880 umhos/cm. No MCL/MCLGs were exceeded in this discharge. The acute aquatic life criteria for zinc as well as the chronic aquatic life criteria for iron, lead, and zinc were exceeded at the pipe discharge.
  
- There was no flowing surface water on site; no surface water samples were collected. A dry creek ran adjacent to tailings. There were observed releases of barium, cadmium, mercury, antimony, and zinc in downstream sediments.
  
- There are ten open adits, five open stopes, numerous hazardous structures, and highwalls on site.

Flathead Mine PA# 15-012  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/05/83

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
15-012-SE-1	20 J	262	9.05	13.3	5.52 U	21.4	11700	0.243	1520	10.2 U	48.1	24.8 U	1270	NR
15-012-SE-2	15.4 J	70.9	0.54 U	2.03 U	1.43 U	26	13100	0.031	64.3	2.65 U	27.1	6.43 U	80	NR
15-012-TP-1	160 J	711	12.2	1.78 U	1.87	348	15800	1.58	3.19	2.32 U	3330	130	3470	NR
15-012-WR-1	310 J	1000	5.94	1.96 U	1.38 U	116	22800	1.91	72.5	2.56 U	3460	125	2070	NR
15-012-WR-2	778 J	2160	2.85	1.57 U	1.1 U	84.7	20600	6.1	30.7	2.05 U	16500	114	201	NR
15-012-WR-3	134 J	89.1	1.12	1.66 U	1.87	34	13800	0.734	92	2.16 U	1700	89.3	119	NR
15-012-WR-4	3690 J	82.4	21.3	6.03	1.94	5760	139000	1.84	12.1	5.77	21100	438	2030	NR
BACKGROUND	7.17 J	283	1.28	4.96	3.23	9.38	14100	0.046	1220	5.12	20.7	5.23 U	149	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /10000	NEUTRAL POTENT. /10000	SULFUR ACID BASE POTENT. /10000	SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR /10000	PYRITIC SULFUR ACID BASE /10000	SULFUR ACID BASE POTENT. /10000	% clay	% sand	% silt	% Coarse Material (>2mm)	Cation Exchange Capacity milliequiv./100
15-012-TP-1	1.89	59.0	-3.55	-82.6	0.25	1.37	42.8	-46.3	-40.5	6	54	40	0	0.63
15-012-WR-1	3.00	93.7	-5.49	-99.2	0.57	1.12	35.0	-40.5	-4.11					
15-012-WR-2	1.62	50.6	-2.23	-52.8	0.77	0.06	1.87	-10.9	-384					
15-012-WR-3	0.86	27.0	-1.51	-28.5	0.35	0.21	9.37	-378	-373					
15-012-WR-4DUP	25.3	791	-5.35	-796	<0.01	12.1	378							
15-012-WR-4	25.6	798	-5.21	-803	<0.01	11.8	367							

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
15-012-GW-1	102 J	13.9	1710	187 U	6.83 U	1170	71800 J	0.310 JX	6060	121	826 J	73.6	62300 J
15-012-GW-2	32.6 J	16.5	2.57 U	9.7	7.63	1.55 U	15100 J	0.220 JX	4040	12.7 U	3.79 J	30.7 U	4830 J

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
15-012-GW-1	2200	7.7	1320	1.9	NR
15-012-GW-2	292	< 5.0	162	< 0.05	NR

LEGEND

SE1 - Sullivan Ck. downstream from Flathead & W. Flathead areas  
SE2 - Sullivan Ck. upstream from the W. Flathead area  
TP1 - Composite of subsamples TP1A, 1B, 1C, 2A, 2B, and 2C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.  
WR2 - Composite of subsamples WR2A, 4A, 5A, and 5B.  
WR3 - Composite of subsamples WR6, 7A, 7B, 8, and 12B.  
WR4 - Composite of subsamples WR9, 10A, and 11.  
BACKGROUND - From the Flathead Mine (15-012-SS-1).

GW1 - Flathead Mine western edit assoc. w/ WR2  
GW2 - West Flathead Mine from pipe at mine.

HARDNESS CALC.

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
15-012-GW-1	102 J	13.9	1710	187 U	6.83 U	1170	71800 J	0.310 JX	6060	121	826 J	73.6	62300 J
15-012-GW-2	32.6 J	16.5	2.57 U	9.7	7.63	1.55 U	15100 J	0.220 JX	4040	12.7 U	3.79 J	30.7 U	4830 J

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Karst Asbestos</u>	County: <u>Gallatin</u>
Legal Description: <u>T 5S R 4E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 36</u>
Mining District: <u>West Gallatin</u>	Mine Type: <u>Hardrock/Asbestos</u>
Latitude: <u>N 45° 21' 25"</u>	Primary Drainage: <u>Gallatin River</u>
Longitude: <u>W 111° 10' 60"</u>	USGS Code: <u>10020008</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Gallatin River</u>
Quad: <u>Hidden Lake</u>	Date Investigated: <u>August 13, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>16-018</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- An asbestos mine and washing mill were located at this site. Anthophyllite asbestos was detected on-site.
- An unnamed tributary to the Gallatin River flowed adjacent to the washing mill. An observed release to the tributary was documented for asbestos. However, the MCL for asbestos was not exceeded; and no acute or chronic aquatic life criteria exist for asbestos. Asbestos was not detected in upstream or downstream sediment samples.

Karst Asbestos PA# 16-018  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/13/93

SOLID MATRIX ANALYSES

FIELD ID	Homogeneity	Color	Texture	Sample Description	Analysis	Asbestos Type Identified	% Anthrophyllite (Conc. on area basis)	% Total Asbestos (Conc. on area basis)	% Cellulose	% Other Non-Fibrous (Range)
16-018-SE-1*	Heterogeneous	Brown	Granular	Soil	PLM	-	NR	ND	Trace	90-100
16-018-SE-2*	Heterogeneous	Brown	Granular	Soil	PLM	-	NR	ND	Trace	90-100
16-018-WR-1*	Heterogeneous	Brown	Granular	Soil	PLM	100% Anthro.	5-10	5-10	Trace	90-100
16-018-WR-2*	Heterogeneous	Brown	Granular	Soil	PLM	100% Anthro.	5-10	5-10	Trace	90-100
Karst Mine**	Homogeneous	Grey	Fibrous	-	PLM	100% Anthro.	-	NR	-	0
Karst Mill**	Homogeneous	Grey	Fibrous	-	PLM	95% Anthro. 5% OTHER	-	NR	-	5

NR - Not Reported; ND - Not Detected; Trace = <1%  
\* Data obtained from DATACHEM Laboratories.

\*\* Data obtained from EMSL.

WATER MATRIX ANALYSES

FIELD ID	Chrysotile (MFL)	Grunerite (MFL)	Riebeckite (MFL)	Actinolite-Tremolite (MFL)	Anthrophyllite (MFL)	Total Fibers Detected	Total Asbestos Conc. (MFL)	Limit of Detection (MFL)
16-018-SW-1*	<LOD	<LOD	<LOD	<LOD	<LOD	0	<LOD	0.09
16-018-SW-2*	<LOD	<LOD	<LOD	0.38	0.38	4	0.76	0.19

LOD - Less than limit of detection.  
MFL - Millions of fibers per liter.

LEGEND

SE1 - 200' upgradient of mill in unnamed tributary.  
SE2 - 200' downgradient of mill in unnamed tributary.  
WR1 - In waste rock pile in front of edit #1.  
WR2 - In downgradient washing mill in waste rock.  
SW1 - Same location as SE1. Sample also contained asbestos fiber <10um long and many non-asbestos fibers.  
SW2 - Same location as SE2.  
NOTE: EPA regulations specify that drinking water must contain less than 7MFL asbestos.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Alps</u>	County: <u>Granite</u>
Legal Description: T <u>10N</u> R <u>16W</u>	Section(s): <u>SE 1/4, Sec. 27</u>
Mining District: <u>Alps</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 35' 35"</u>	Primary Drainage: <u>Brewster Creek</u>
Longitude: <u>W 113° 35' 10"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Unnamed tributary to</u>
Quad: <u>Spink Point</u>	<u>Brewster Creek</u>
Inspectors: <u>Babits/Pierson</u>	Date Investigated: <u>June 30, 1993</u>
Organization: <u>Pioneer Technical Services,</u>	P.A. # <u>20-065</u>
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no tailings on site.
- There were approximately 14,023 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:  
Arsenic: 63JX mg/kg                      Iron: 99,700J mg/kg  
Mercury: 0.355 mg/kg
- There was one discharging adit that did not have a surface route to water. The sample from the adit had a pH measured at 4.13. There were no MCLs or MCLGs exceeded.
- The nearest surface water was approximately 1,000 feet from the site. No surface water or sediment samples were collected.
- There was one open shaft and two open adits on site.

Alps PA# 20-065  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/30/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-065-WR-1	51 JX	287	0.4 U	1 U	0.8 U	4.6	29000 J	0.159	140 J	2 J	6 J	3 U	10 J	NR
20-065-WR-2	63 JX	981	0.4 U	2.6 J	1.6 J	7.9	99700 J	0.355	1390 J	12 J	16 J	3 U	16 J	NR
BACKGROUND	19 JX	415	0.6 U	2.4 J	4.6 J	5.6	17300 J	0.067	985 J	8 J	12 J	4 U	26 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			SULFATE			PYRITIC			SULFUR		
	SULFUR	ACID BASE	%	NEUTRAL	POTENT.	%	ACID BASE	POTENT.	%	SULFUR	ACID BASE	POTENT.	ACID BASE	POTENT.	%
20-065-WR-1	0.14	4.37	0.14	-0.5	1.01	0.07	-4.8	-15	0.11	-0.01	0.03	0	0	-0.45	-0.87
20-065-WR-2	0.52	16.2	0.52	1.01	1.01	0.07	-15	-15	0.07	0.06	0.39	1.87	1.87	-0.87	-0.87

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-065-GW-1	4.22 J	65.2 JX	2.57 U	9.7 U	6.83 U	1.55 U	4930	0.038 U	1130	12.7 U	1.36	30.7 U	14.1	40.3

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-065-GW-1	109	< 5.0	62	< 0.05	NR

LEGEND

WR1 - Composite of subsamples WR1 and 2.

WR2 - Sample of the subsample WR4.

BACKGROUND - Approx. 100 feet above waste rock dump 4.

From the Alps Mine (20-065-SS-1).

GW1 - Discharging edit at waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Argo</u>	County: <u>Granite</u>
Legal Description: T <u>10N</u> R <u>16W</u>	Section(s): <u>SW 1/4, NE 1/4, Section 35</u>
Mining District: <u>Alps</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 34' 50"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 113° 34' 10"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Harvey Creek</u>
Quad: <u>Spink Point</u>	Date Investigated: <u>July 6, 1994</u>
Inspectors: <u>Tuesday, Belanger, West</u>	P.A. # <u>20-081</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 10 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Barium: 2,840 mg/kg  
Lead: 460 mg/kg  
Mercury: 0.29J mg/kg
- The volume of waste rock observed at the site was estimated to be 1,700 cubic yards. The following element was elevated to at least three times the background concentrations:  
Mercury: 0.33J mg/kg
- One discharging adit was associated with the site. The MCL for antimony and the chronic aquatic life criteria for lead were exceeded in the adit discharge.
- Harvey Creek flows adjacent to the site on the southwest side. No observed releases to Harvey Creek were documented. The acute and chronic aquatic life criteria for cadmium were exceeded in the downstream sample, although not attributable to this site.
- Potential safety hazards observed at the site included one open adit.

Argo PA# 20-081  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/06/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-081-SE1	0.5 U	9.8 J	345	0.8 J	66.7	3.5 J	23.3 J	24700	0.08 J	2570	44.3 JX	7.2 U	5.8 UJX	54.7	NR
20-081-SE2	0.6 U	10.5 J	556	0.6 UJ	14.0	2.5 J	16.8 J	18300	0.06 J	1290	13.3 JX	8.2 U	6.6 UJX	16.8	NR
20-081-TP1	1.3	36.0 J	2840	0.5 UJ	1.6 U	9.5 J	13.8 J	25600	0.29 J	27.3	1.5 UJX	480	5.3 UJX	28.2	NR
20-081-WR1	0.4 U	29.3 J	316	0.4 UJ	2.6	1.2 J	3.6 J	23100	0.33 J	183	1.5 JX	33.4	4.5 UJX	29.1	NR
BACKGROUND	NR	19 JX	415	0.6 U	2.4 J	4.6 J	5.6	17300 J	0.067	985 J	8 J	12 J	4 U	26 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT	1/1000
20-081-TP1	0.23	7.19	-0.71	-7.90	0.16	0.04	0.03	1.25	0.04	0.01	0.02	0.31	0.04	0.01	-1.98	-0.90
20-081-WR1	0.24	7.50	-0.59	-8.1	0.21	0.01	0.02	0.31	0.01	0.01	0.02	0.31	0.01	0.01	-0.90	-0.90

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-081-AD1	0.12 U	1.1 U	184	2.6 U	8.7 U	4.7 U	4.6 U	438	0.11 U	108	8.0 U	0.6	34.1 JX	10.5 JX	18.7
20-081-SW1	0.12 U	1.1 U	80.2	2.7	8.7 U	4.7 U	4.6 U	61.1	0.11 U	18.3	8.0 U	0.4 U	31.0 JX	4.5 UJX	12.3
20-081-SW2	0.12 U	1.1 U	80.5	2.6 U	8.7 U	4.7 U	4.6 U	24.4	0.11 U	4.4 U	8.2	0.5	50.0 JX	4.5 UJX	9.0
20-081-SW3	0.12 U	1.1 U	80.5	2.6 U	8.7 U	4.7 U	4.6 U	360	0.11 U	11.0	8.0 U	0.8	45.4 JX	10.5 JX	11.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-081-AD1	49	<5.0	11	11	NR
20-081-SW1	44	<5.0	8.0	0.05	NR
20-081-SW2	34	<5.0	<5.0	0.07	NR
20-081-SW3	15	<5.0	7.0	0.12	NR

LEGEND

SE1 - Dissolution of the site in Harvey Creek.  
SE2 - Dissolution of the site in Harvey Creek.  
TP1 - Composite of the subsamples TP1A and 1B.  
WR1 - Composite of the subsamples WR1A, 1B, 2A, and 2B.  
BACKGROUND - From the Argo Mine (22-465-881) (1993 Data).

AD1 - Discharge from site associated with WR1 and WR2.  
SW1 - Same as sample 20-081-SE1.  
SW2 - Same as sample 20-081-SE2.  
SW3 - Same as sample 20-081-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Silver King</u>	County: <u>Granite</u>
Legal Description: <u>T 6N R 15W</u>	Section(s): <u>Sec. 5</u>
Mining District: <u>Antelope Creek</u>	Mine Type: <u>Hardrock/Ag. Au</u>
Latitude: <u>N 46° 18' 05"</u>	Primary Drainage: <u>Rock Creek</u>
Longitude: <u>W 113° 30' 00"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Sluice Gulch</u>
Quad: <u>Cornish Gulch</u>	Date Investigated: <u>June 30, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>20-186</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 29,255 cubic yards. The following elements were elevated at least three times background:

Arsenic: 444JX to 575JX mg/kg	Manganese: 1,440 mg/kg
Copper: 122 to 287 mg/kg	Lead: 43J to 137J mg/kg
Iron: 44,500J to 47,600J mg/kg	Antimony: 80J to 269J mg/kg
Mercury: 1.47 to 4.9 mg/kg	
- There was one flowing adit associated with the site. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria were exceeded for copper.
- Sluice Gulch Creek was flowing adjacent to the site on the west side during the investigation, and upstream and downstream surface water samples were collected. No observed releases were documented and MCL/MCLGs were not exceeded. No aquatic life criteria were exceeded that were attributable to the site.
- Potentially hazardous mine openings associated with the site included five open adits, one collapsed adit, and an open stope. Another adit had been secured by a metal door.

Silver King PA# 20-186  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/30/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Pb (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-186-SP-1	575 JX	465	0.5 U	2.2 J	4.4 J	122	22900 J	1.47	365 J	43 J	80 J	23 J	NR
20-186-WR-1	444 JX	214	0.6 U	6.4 J	6.8 J	287	44500 J	2.27	1440 J	89 J	99 J	56 J	NR
20-186-WR-4	450 JX	718	0.6 U	6.9 J	12.7 J	185	47600 J	4.9	407 J	137 J	269 J	42 J	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE v/1000	NEUTRAL POTENT v/1000	SULFUR ACID BASE POTENT v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000	SULFUR ACID BASE POTENT v/1000
20-186-SP-1	0.11	3.44	2.08	-1.4	0.05	0.02	0.04	0.62	1.46
20-186-WR-1	3.22	101	46.7	-54	0.54	2.13	0.55	66.5	-19.8
20-186-WR-4	0.4	12.5	0.84	-12	0.38	<0.01	0.03	0	0.84

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
20-186-GW-1	6.95 J	7.83 JX	2.57 U	9.7 U	6.83 U	197 J	273	0.038 U	901	12.7 U	1 U	30.7 U	86.9
20-186-SW-1	15.1 J	58.2 JX	2.57 U	9.7 U	6.83 U	155 U	428	0.038 U	14.8	12.7 U	1.64	30.7 U	7.57 U
20-186-SW-2	14.7 J	56.4 JX	2.7 J	9.7 U	7.97	155 U	361	0.038 U	10.4	12.7 U	1 U	30.7 U	141

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-186-GW-1	402	8.7	144	0.3	NR
20-186-SW-1	182	5.0	10	0.12	NR
20-186-SW-2	160	7.7	10	0.12	NR

LEGEND

- SP1 - Composite of subsamples SP1A and 1B.  
WR1 - Composite of subsamples WR1A, 1B, 2, and 3.  
WR4 - Composite of subsamples WR4 and 5.  
BACKGROUND - From the Montana Prince Mines (41-004-SS-1).
- GW1 - End of pipe pumping water from adit #1.  
SW1 - 100' upstream of adit #1.  
SW2 - 100' downstream of last structure to the North.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lori No. 13</u>	County: <u>Granite</u>
Legal Description: <u>T 6 N R 15 W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 4</u>
Mining District: <u>Antelope Creek</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 18' 17"</u>	Primary Drainage: <u>Rock Creek</u>
Longitude: <u>W 113° 29' 00"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Sluice Gulch</u>
Quad: <u>Antelope Creek</u>	Date Investigated: <u>September 10, 1993</u>
Inspectors: <u>Babits/Pierson</u>	P.A. # <u>20-191</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were identified at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 700 cubic yards. The waste rock pile was well vegetated; consequently, no samples were collected.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation; and no surface water was identified on or near the site, the nearest surface water was located approximately 800 feet south of the site. No groundwater or surface water samples were collected.
- One potentially hazardous open adit was identified at the site.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Ant</u>	County: <u>Granite</u>
Legal Description: <u>T 6 N R 15 W</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 34</u>
Mining District: <u>Antelope Creek</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 14' 08" or 09"</u>	Primary Drainage: <u>Rock Creek</u>
Longitude: <u>W 113° 27' 12"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>South Fork Antelope Creek</u>
Quad: <u>Potato Lakes</u>	Date Investigated: <u>September 9, 1993</u>
Inspectors: <u>M. Babits, S. Babits/Pierson</u>	P.A. # <u>20-194</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 2,300 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1,060 mg/kg	Barium: 3,420J mg/kg
Copper: 50.6J mg/kg	Iron: 67,200 mg/kg
Mercury: 0.312 mg/kg	
- One adit which contained water was identified at the site; however, the water was not flowing. The pH measurement in the ponded water was 2.9. No MCLs were exceeded in the water; however, the chronic aquatic life criteria for iron was exceeded.
- No surface water was identified on or adjacent to the site. The nearest surface water, South Fork of Antelope Creek, was located approximately 450 feet east of the site. No surface water or sediment samples were collected.
- Four potentially hazardous open adits were identified at the site.

Ant PA# 20-194  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/09/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-194-WR-1	1060	3420 J	0.6 U	2.13 U	4.95	50.6 J	67200	0.312	321 J	2.78 U	25.2	11.4 J	26.9	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
20-194-WR-1	0.63	19.7	3.94	-16	0.01	0.07	0.55	2.19	1.75							

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-194-SW-1	3.5	2.01 U	2.57 U	9.7 U	6.83 U	3.1 J	1700	0.12 UJX	604	19.6 JX	2.83	30.7 U	13.7 J	639

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-194-SW-1	950	< 5.0	519	0.63	NR

LEGEND

WR1 - Composite of subsamples WR1A and 1B.  
BACKGROUND - From Montana Prices (41-004-SS-1).

SW1 - Adit discharge at waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Combination Millsite</u>	County: <u>Granite</u>
Legal Description: <u>T 8N R 14W</u>	Section(s): <u>SE 1/4, E 1/2, Sec. 7</u>
Mining District: <u>Combination</u>	Mine Type: <u>Hardrock/Cu, Pb, Zn, Ag, Au</u>
Latitude: <u>N 46° 27' 30"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 23' 30"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>South Fork Lower Willow Creek</u>
Quad: <u>Black Pine Ridge</u>	Date Investigated: <u>July 21, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>20-009</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The mill tailings associated with this site were not impounded but were in the floodplains of both Mill Creek and South Fork Lower Willow Creek; the tailings extended one half mile downstream from the site in the S. F. Lower Willow Creek floodplain. The volume of these tailings were estimated at 69,500 cubic yards and were 20% revegetated. Some reclamation/ revegetation work was done by Inspiration Mining on the floodplain tailings. The following elements were elevated at least three times background:

Arsenic : 2,050 mg/kg	Barium: 1,100 mg/kg
Cadmium: 89.5 mg/kg	Copper: 9,620 mg/kg
Mercury: 306J mg/kg	Lead: 14,400 mg/kg
Antimony: 2,210 mg/kg	Zinc: 584 mg/kg
- There was no waste rock associated with this site.
- An observed release to surface water (S. F. Lower Willow Creek) was documented in sediments for arsenic, cadmium, copper, mercury, lead, antimony, and zinc, and in water samples for copper and lead. No exceedances of drinking water standards were found in either creek.
- Aquatic life criteria for copper and lead (acute) and copper, lead, and mercury (chronic) were exceeded in downstream samples; criteria for copper (acute) and copper and lead (chronic) were also exceeded in upstream samples. A possible upstream contaminant source (e.g. Combination Mine) may be responsible for the exceedances.
- The old mill foundation could be hazardous. A vat of unknown contents (15 cubic yards), and a pile of white powder may be hazardous materials.
- No adit discharges, springs or seeps were observed at the site.

Combination PA# 20-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/21/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-009-SE-1	311	105	6.9	6.01	1.74	830	10800	52.3 J	372 J	2.8 U	1550	337	241	NR
20-009-SE-2	37.1	286	2.4	6.5	10.2	250	13400	1.07 J	605 J	13.7	91.2	27.4	80.1	NR
20-009-SE-3	10.2	94.9	0.9	2.93	2.45	18.8	3710	0.083 J	206 J	2.49 U	21	6.07	32.6	NR
20-009-TP-1	2050	1100	89.5	3.33	4.51	9620	28300	306 J	462 J	3.29	14400	2210	584	NR
BACKGROUND	76.3	329	1.6	6.18	6.06	116	11700	1.33 J	1530 J	6.77	85.8	33.3	47.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	POTENT. 1/1000	ACID BASE 1/1000	POTENT. 1/1000	NEUTRAL. 1/1000	POTENT. 1/1000	ACID BASE 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR %	ACID BASE 1/1000	POTENT. 1/1000	ACID BASE 1/1000
20-009-TP-1	0.08	2.5	1.81	-0.7	0.06	<0.01	0.02	0	0.02	0	0.02	0	0.02	0	1.81	1.81

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-009-SW-1	3.25	78.5	2.57 U	9.7 U	6.83 U	21.9	410	0.081	20.9	12.7 U	9.93	30.7 U	7.57 U	15.1
20-009-SW-2	2.4	69.7	2.57 U	9.7 U	6.83 U	17.2	1280	0.038 U	17.4	12.7 U	3.3	30.7 U	7.57 U	21
20-009-SW-3	1.69 U	78.2	2.57 U	9.7 U	6.83 U	1.9	264	0.038 U	15.6	12.7 U	1.55 U	30.7 U	7.57 U	14.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-009-SW-1	89	< 5.0	7	0.16	NR
20-009-SW-2	112	< 5.0	14	< 0.05	NR
20-009-SW-3	95	< 5.0	6	0.18	NR

LEGEND

SE1 - Downstream from junction of Mill Creek and Willow Creek.  
SE2 - Upstream in Mill Creek.  
SE3 - Upstream in S. Fork Lower Willow Creek.  
TP1 - Composite of subsamples TP1A1, 1B2, 1C1, and 1D1.  
BACKGROUND - From the Combination Mine (20-009-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Forest Rose</u>	County: <u>Granite</u>
Legal Description: <u>T 9N R 12W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 22</u>
Mining District: <u>Dunkleburg</u>	Mine Type: <u>Hardrock/Pb, Zn, Ag</u>
Latitude: <u>N 46° 30' 29"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 113° 05' 21"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Dunkleburg Creek</u>
Quad: <u>Dunkleburg Creek</u>	Date Investigated: <u>June 29, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>20-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 23,000 cubic yards. The dam at the lower impoundment failed just prior to this investigation. The following elements were elevated at least three times background:

Arsenic: 330JX to 444JX mg/kg	Mercury: 0.342 to 0.377 mg/kg
Cadmium: 58.2J to 143J mg/kg	Lead: 690J to 6,8810J mg/kg
Copper: 404 to 563 mg/kg	Antimony: 28J to 49J mg/kg
Iron: 109,000J to 113,000J mg/kg	Zinc: 6,590J to 16,800J mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 8,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 227 to 801JX mg/kg	Mercury: 0.648J to 2.93 mg/kg
Cadmium: 3.2J to 477J mg/kg	Lead: 242J to 60,400J mg/kg
Copper: 208 to 1,770 mg/kg	Antimony: 24J to 470J mg/kg
Iron: 75,700 to 164,000 mg/kg	Zinc: 2,840J to 51,500J mg/kg
- One discharging adit was identified at the site. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria were exceeded for zinc, and the chronic aquatic life criteria for cadmium were exceeded in the adit discharge.
- Three surface water and sediment samples were collected at the site from Dunkleburg Creek. One sample was collected from the toe of WR-1, to determine potential impacts from the waste rock and samples were collected both upstream and downstream from the site, proper. Observed releases to Dunkleburg Creek were documented for arsenic, copper, iron, and lead. The MCL/MCLG for antimony was exceeded in both upstream and downstream samples. The chronic aquatic life criteria exceedances for iron and lead were directly attributable to the site. Other aquatic life criteria were exceeded, but not directly attributable to this site. Dunkleburg Creek was very turbid at the time of the investigation due to a recent breach in the tailings impoundment.
- Potential safety hazards identified at the site included an open adit, 12 collapsing structures, and two unstable tailings dams.

Forest Rose PA# 20-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/29/93

SOLID MATRIX ANALYSES

Metals in soils			Results per dry weight basis												CYANIDE
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	(mg/Kg)	
20-004-SE-1	116 JX	65.8	14.8 J	11.1 J	19.9 J	125	45600 J	0.13	1370 J	34 J	1010 J	4 U	2040 J	NR	
20-004-SE-2	51 JX	25.6	22 J	3 J	3.3 J	53.7	13700 J	0.1	1310 J	17 J	428 J	4 U	1270 J	NR	
20-004-SE-3	67 JX	118	13.5 J	9.5 J	16.2 J	41.7	43200 J	0.049	819 J	34 J	2820 J	6 J	2230 J	NR	
20-004-TP-1	336 JX	37.6	58.2 J	2 J	3.8 J	444	38800 J	0.342	2090 J	15 J	6810 J	49 J	7430 J	NR	
20-004-TP-2	444 JX	15	143 J	11.2 J	4.4 J	563	109000 J	0.377	1720 J	28 J	1820 J	28 J	16800 J	NR	
20-004-TP-3	330 JX	12.2	65.1 J	14.3 J	3.4 J	404	113000 J	0.052	1730 J	29 J	690 J	9 J	6590 J	NR	
20-004-WR-1	227	13.1	40.9	8.6	2.9	208	39200	0.848 J	1110	29	4570	24 J	5680	NR	
20-004-WR-3	801 JX	31.2	477 J	3.5 J	4 J	1770	75700 J	2.93	1760 J	15 J	60400 J	470 J	51500 J	NR	
20-004-WR-4	350 JX	23.1	3.2 J	4 J	3 J	526	164000 J	0.934	165 J	16 J	242 J	7 J	2840 J	NR	
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR	
Acid/Base Accounting															
TOTAL		TOTAL		SULFUR		SULFUR		PYRITIC		SULFUR		SULFUR		SULFUR	
TOTAL		SULFUR		ACID BASE		PYRITIC		SULFUR		ORGANIC		PYRITIC		ACID BASE	
SULFUR		ACID BASE		POTENT.		SULFUR		SULFUR		SULFUR		SULFUR		POTENT.	
%		v/1000		v/1000		%		v/1000		%		v/1000		v/1000	
FIELD ID	5.86	167	590	423	1.94	2.48	0.94	77.5	513						
20-004-TP-1	13.8	430	265	-165	<0.01	16	2.8	499	-234						
20-004-TP-2	13.7	429	265	-163	<0.01	16	2.8	500	-235						
20-004-TP-3	13.3	415	191	-224	<0.01	14.6	1.94	456	-265						
20-004-TP-3DUP	13.3	416	186	-230	<0.01	14.5	1.96	453	-267						
20-004-WR-1	4.76	149	355	206	3.31	0.09	1.36	2.81	352						
20-004-WR-3	7.67	240	64.3	-175	2.71	2.89	2.07	90.3	-26						
20-004-WR-4	6.63	207	-5.8	-213	0.06	4.95	1.62	155	-160						

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

FIELD ID	Metals in Water					Results in ug/L					HARDNESS CALC. Zn (mg CaCO3/L)															
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn													
20-004-GW-1	3 J	22.6 JX	4.1 J	9.7 U	6.83 U	4.1 J	113	0.038 U	35.5	12.7 U	3.86	30.7 U	1700													
20-004-SW-1	6.45	82.2	3.7 J	7.63 JX	17.9	31.9	16100	0.038 U	453	24.2	68.7	23.8	474													
20-004-SW-2	1.92	13.3	2.55 U	5.99 UX	8.83	1.43	104	0.038 U	7.47	9	9.13	18.3 U	374													
20-004-SW-3	1.41	11.3	3.3 J	5.99 UX	5.27	5.7	54.5	0.038 U	6.07	8.78 U	1.73	19.4	346													
Wet Chemistry																										
TOTAL																										
FIELD ID	DISSOLVED SOLIDS				CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE																		
20-004-GW-1	309	<	5.0	78	0.1	NR																				
20-004-SW-1	448	<	5.0	160	0.07	NR																				
20-004-SW-2	250	<	5.0	77	<	0.05	NR																			
20-004-SW-3	224	<	5.0	50	0.06	NR																				

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested																		
LEGEND																		
SE1 - Downstream of breached dam on tailings pond 3.																		
SE2 - At toe of waste rock dump 1.																		
SE3 - Approx. 400' upstream of end of waste rock dump 2.																		
TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1A-D, 1B-A, 1B-B, 1B-C, 1B-D, 1B-E, and 1B-F.																		
TP2 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2B-A, 2B-B, and 2B-C.																		
TP3 - Composite of subsamples TP3A-A, 3A-B, 3B-A, 3B-B, and 3B-C.																		
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.																		
WR3 - Composite of subsamples WR3A, 3B, and 3C.																		
WR4 - Composite of subsamples WR4A and 4B.																		
BACKGROUND - From the Jackson Park Mine (20-027-SS-1).																		
TP2DUP - Duplicate of sample 20-004-TP-2.																		
TP3DUP - Duplicate of sample 20-004-TP-3.																		
GW1 - Discharge from adit #1.																		
SW1 - Same as sample SE1.																		
SW2 - Same as sample SE2.																		
SW3 - Same as sample SE3.																		

SE1 - Downstream of breached dam on tailings pond 3.  
SE2 - At toe of waste rock dump 1.  
SE3 - Approx. 400' upstream of end of waste rock dump 2.  
TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1A-D, 1B-A, 1B-B, 1B-C, 1B-D, 1B-E, and 1B-F.  
TP2 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2B-A, 2B-B, and 2B-C.  
TP3 - Composite of subsamples TP3A-A, 3A-B, 3B-A, 3B-B, and 3B-C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.  
WR3 - Composite of subsamples WR3A, 3B, and 3C.  
WR4 - Composite of subsamples WR4A and 4B.  
BACKGROUND - From the Jackson Park Mine (20-027-SS-1).  
TP2DUP - Duplicate of sample 20-004-TP-2.  
TP3DUP - Duplicate of sample 20-004-TP-3.  
GW1 - Discharge from adit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.

LEGEND

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Wasa</u>	County: <u>Granite</u>
Legal Description: <u>T 9N R 12W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 27</u>
Mining District: <u>Dunkleburg</u>	Mine Type: <u>Hardrock/Zn, Au, Ag, Pb, Cu</u>
Latitude: <u>N 46° 29' 53"</u>	Primary Drainage: <u>Douglas Creek</u>
Longitude: <u>W 113° 05' 38"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>North Fork of Douglas Creek</u>
Quad: <u>Pikes Peak</u>	
Inspectors: <u>Babits, Lasher/Pierson</u>	Date Investigated: <u>June 29, 1993</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	P.A. # <u>20-023</u>

- There were no tailings on site.
- There were approximately 14,000 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 53 to 108 mg/kg	Cadmium: 10 to 25.3 mg/kg
Copper: 116 to 736 mg/kg	Iron: 98,500 mg/kg
Mercury: 0.328J to 0.452J mg/kg	Lead: 293 mg/kg
Zinc: 382 to 5,670 mg/kg	
- There were two discharging adits on site that entered surface water. The samples had pH measurements of 2.57 and 7.50. There was also a pit that held groundwater. This sample had a pH 7.94. The low pH adit exceeded MCLs for cadmium, copper, and antimony. The other adit and pit exceeded MCLs for cadmium and antimony. The chronic aquatic life criteria for iron, nickel, and lead was exceeded in the low pH adit. The chronic and acute aquatic life criteria for copper and zinc was exceeded in the low pH adit. The acute aquatic life criteria was exceeded for cadmium in the neutral pH adit. The chronic and acute aquatic life criteria for zinc was exceeded in the neutral pH adit. The acute and chronic aquatic life criteria for copper zinc was exceeded in the pit.
- The creek ran through waste rock. There were observed releases of cadmium, copper, and zinc in downstream surface water. The acute aquatic life criteria for cadmium was exceeded in downstream surface water. The acute and chronic aquatic life criteria for copper and zinc was exceeded in downstream surface water; however, none of the exceedances were directly attributable to the site.
- There was one open adit and one highwall on site.

**Wasa PA# 20-023**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 06/29/93**

**SOLID MATRIX ANALYSES**

**Metals in soils Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-023-SE-1	166	95.9	5.7	67.9	9.2	973	21600	0.028 J	1960	35	72	4 J	308	NR
20-023-SE-2	77	67.4	54.4	78.8	7.9	833	39100	0.058 J	3860	110	94	15 J	8720	NR
20-023-WR-1	81	113	19.2	16.3	8.5	588	35700	0.066 J	1490	28	86	11 J	4010	NR
20-023-WR-2	102	40.7	0.5 U	1.3	8.2	72	20900	0.452 J	45.7	3	293	14 J	67	NR
20-023-WR-3	53	88.9	25.3	29	8.8	736	55400	0.038 J	1460	52	88	12 J	5670	NR
20-023-WR-4	108	25.8	0.4 U	4.6	8.2	408	98500	0.328 J	210	5	44	4 J	382	NR
20-023-WR-5	60	29.6	10	4.8	1.7	116	46300	0.366 J	664	21	72	4 J	1760	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE V/1000	NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE V/1000	SULFUR ACID BASE POTENT. V/1000
20-023-WR-1	0.03	0.94	6.86	5.93	<0.01	<0.01	0.06	0	6.86
20-023-WR-2	0.63	19.7	0.79	-19	0.41	0.08	0.14	2.5	-1.71
20-023-WR-3	0.06	1.87	7.91	6.04	0.02	<0.01	0.04	0	7.91
20-023-WR-4	2.25	70.3	-3.1	-73	2.09	0.05	0.11	1.56	-4.64
20-023-WR-5	1.59	49.7	58.3	8.66	0.85	0.46	0.28	14.4	44

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**WATER MATRIX ANALYSES**

**Metals in Water Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
20-023-GW-1	28.9	11	208 J	69.6 JX	5 U	3330	11500	0.038 U	309	169	1.77	18.3 U	4540	32.2
20-023-GW-2	1.38	6.33	19.1 J	5.99 UX	5 U	10.5	303	0.038 U	93.2	29.4	1.41	20	3160	289
20-023-GW-3	0.98 U	9.73	26 J	6.7 JX	6.93	19.4	125	0.038 U	51.4	22.5	0.7	29.7	1770	74.5
20-023-SW-1	6.19	20.1	2.57 J	5.99 UX	5 U	17.4	55.7	0.038 U	19.3	9.07	2.63	18.3 U	89.5	17.2
20-023-SW-2	2.89	8.2	51.7 J	7.77 JX	6.5	95.9	112	0.044	120	43.9	1.47	28.4	5250	274

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-023-GW-1	260	< 5.0	179	0.06	NR
20-023-GW-2	400	< 5.0	187	0.19	NR
20-023-GW-3	139	< 5.0	52	NR	NR
20-023-SW-1	58	< 5.0	13	< 0.05	NR
20-023-SW-2	409	< 5.0	178	< 0.05	NR

**LEGEND**

SE1 - Upgradient in North Fork Douglas Creek.  
 SE2 - Downgradient in North Fork Douglas Creek.

WR1 - Composite of subsamples WR1 and 3.

WR2 - Sample of subsample WR2.

WR3 - Sample of subsample WR4.

WR4 - Composite of subsamples WR5 and 6.

WR5 - Composite of subsamples WR7A and 7B.

BACKGROUND - From Jackson Park Mine (20-027-SS-1).

GW1 - Aftit discharge at waste rock dump 2. Discharge goes to N. Fork Douglas Creek.

GW2 - Aftit discharge at waste rock dump 6.

GW3 - From pit.

SW1 - Same as subsample SE1.

SW2 - Same as subsample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Jackson Park</u>	County: <u>Granite</u>
Legal Description: <u>T 9 N R 12 W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 13</u>
Mining District: <u>Dunkleburg</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 31' 50"</u>	Primary Drainage: <u>Dunkleburg Creek</u>
Longitude: <u>W 113° 03' 23"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Unnamed tributary to</u>
Quad: <u>Drummond</u>	<u>Dunkleburg Creek</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	Date Investigated: <u>July 1, 1993</u>
Organization: <u>Pioneer Technical Services,</u>	P.A. # <u>20-027</u>
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No tailings were observed at this site during the investigation.
- There were approximately 2,900 cubic yards of waste rock on site. The majority of the waste rock was covered. The following were elevated at least three times background:

Arsenic: 685JX to 1,860JX mg/kg	Cadmium: 17.4J to 18.3J mg/kg
Cobalt: 31.5J mg/kg	Chromium: 125J to 139J mg/kg
Mercury: 0.751 to 1.11 mg/kg	Manganese: 3,890J mg/kg
Nickel: 122J mg/kg	Lead: 2,870J to 8,070J mg/kg
Antimony: 61J to 230J mg/kg	Zinc: 3,080J to 3,250J mg/kg
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- No surface water was flowing on or near the site during the investigation; consequently, no surface water or sediment samples were collected.
- No hazardous openings or structures were identified at the site.

Jackson Park PA# 20-027  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/29/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-027-WR-1	685 JX	152	18.3 J	29.2 J	139 J	856	44500 J	0.751	2230 J	122 J	2870 J	61 J	3080 J	NR
20-027-WR-2	1860 JX	101	17.4 J	31.5 J	125 J	902	49900 J	1.11	3890 J	104 J	8070 J	230 J	3250 J	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
20-027-WR-1	0.31	9.68	73.9	64.2	0.3	<0.01	0.01	0	73.9
20-027-WR-2	<0.01	0	45.4	45.4	<0.01	<0.01	0.01	0	45.4

LEGEND

WR1 - Composite of subsamples WR1, 2, and 3.  
WR2 - Sample of the subsample WR4.  
BACKGROUND - From the Jackson Park Mine (20-027-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Millers Mine</u>	County: <u>Granite</u>
Legal Description: T <u>3N</u> R <u>17W</u>	Section(s): <u>NE 1/4, NW 1/4, Section 11</u>
Mining District: <u>Frog Pond</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 01' 49"</u>	Primary Drainage: <u>Copper Creek</u>
Longitude: <u>W 113° 40' 50"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Lutz Creek</u>
Quad: <u>Whetstone Ridge</u>	Date Investigated: <u>July 7, 1994</u>
Inspectors: <u>Tuesday, Belanger, West</u>	P.A. # <u>20-176</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 9,045 cubic yards. The following elements were elevated to at least three times the background concentrations:

Cadmium: 17.1J to 29.5J mg/kg	Lead: 1,980 to 4,020 mg/kg
Copper: 274J to 473J mg/kg	Zinc: 2,020 to 2,570 mg/kg
Arsenic: 68.6J to 92.3J mg/kg	Mercury: 0.78J to 1.73J mg/kg
- A surface water sample was collected downstream from the site after flowing from a bog area. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the sample.
- One discharging adit and two filled shafts were observed at the site during the investigation. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for cadmium and zinc and the chronic aquatic life criteria for iron and lead were exceeded. The MCL for cadmium was exceeded in one of the shafts.
- Potential safety hazards observed at the site included three open shafts, a collapsing headframe, and two collapsing cabins.

Millers Mine PA# 20-178  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/07/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-178-WR1	6.1	69.6 J	179	17.1 J	18.3	6.1 J	473 J	15400	1.73 J	495	4.6 JX	1980	6.8 JX	2570	NR
20-178-WR2	15.7	92.3 J	34.1	29.5 J	1.5 U	1.9 J	274 J	12700	0.78 J	61.0	1.4 UJX	4020	5.2 UJX	2020	NR
BACKGROUND	NR	11 J	267	1.7	11.0	8.7	7.8	12800	0.08 JX	250	9.0	15	5.0 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR		SULFUR ACID BASE		SULFATE		PYRITIC		PYRITIC		SULFUR		SULFUR	
		ACID BASE	POTENT. v/1000t	ACID BASE	POTENT. v/1000t	SULFUR	%	SULFUR	%	SULFUR	%	ACID BASE	POTENT. v/1000t	ACID BASE	POTENT. v/1000t
20-178-WR1	0.86	21.8	1.85	-19	0.55	0.02	0.09	0.62	1.23	0.62	1.23	0.62	1.23	0.62	1.23
20-178-WR2	0.31	9.68	-1.60	-11	0.23	0.02	0.06	0.62	-2.23	0.62	-2.23	0.62	-2.23	0.62	-2.23

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	Au	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-178-AD1	0.12 U	5.7	26.1	4.6	8.7 U	4.7 U	4.6 U	1230	0.11 U	578	8.0 U	16.0 J	29.4 UJ	183 JX	56.1
20-178-GW1	0.12 U	1.7 U	16.3	28.9	8.7 U	4.7 U	17.3	60.5	0.11 U	117	8.0 U	39.7	29.4 U	1080	40.5
20-178-GW2	0.12 U	1.7 U	24.8	2.8	8.7 U	4.7 U	4.6 U	336	0.11 U	136	8.8	1.3 U	29.4 U	21.4	21.7
20-178-SW1	0.12 U	1.1 U	22.1	7.4	8.7 U	4.7 U	17.4	97.8	0.11 U	12.6	8.0 U	0.4 U	29.4 UJ	471 JX	21.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-178-AD1	75	<5.0	5.0	0.10	NR
20-178-GW1	70	<5.0	12	0.07	NR
20-178-GW2	15	<5.0	5.0	0.05	NR
20-178-SW1	44	<5.0	7.0	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1E  
WR2 - Composite of subsamples WR2A and 2B  
BACKGROUND - From the Millers Mine (41-004-581) (1993 Data)

AD1 - Discharge from collapsed adit; collected where remains from ground  
GW1 - Upper shaft at WR1  
GW2 - Lower shaft in bog (flooded)  
SW1 - Below bog where collect runs under trail

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Free Coin/Red Cloud  
Legal Description: T 12N R 14W  
Mining District: Garnet  
Latitude: N 46° 49' 12"  
Longitude: W 113° 20' 44"  
Land Status: Private  
Quad: Elevation Mountain  
Inspectors: Bisch, Flammang, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Granite  
Section(s): SW 1/4, SE 1/4, Section 3  
Mine Type: Hardrock, Millsite/Au  
Primary Drainage: Bear Creek  
USGS Code: 17010201  
Secondary Drainage: First Chance Gulch  
Date Investigated: June 29, 1994  
P.A. # 20-134

- The overall volume of mill tailings associated with the site could not be determined during the investigation. Tailings were observed in several scattered and very small (shallow) pockets near the mill building during the investigation. Additional tailings may be deposited at depth beneath the large waste rock dumps at the site; however, attempts to bore through the waste rock were unsuccessful.
- The volume of waste rock observed at the site was estimated to be 22,325 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 4.8JX mg/kg	Mercury: 2.08 to 2.44 mg/kg
Arsenic: 37.4J mg/kg	Lead: 137 to 171 mg/kg
Copper: 61.4J to 104J mg/kg	
- One discharging adit, which flowed directly into First Chance Gulch, was observed at the site. The MCL for antimony, as well as the chronic aquatic life criteria for lead, were exceeded in the adit discharge.
- First Chance Gulch flows into a constructed, lined pond located near the center of the site. The pond appeared to be part of a diversion structure which directs the flow underground (directly beneath the site). The stream re-emerges downstream from the lowermost workings at the site. No observed releases were documented, and no MCLs or acute or chronic aquatic life criteria were exceeded in the stream.
- Hazardous mine openings observed at the site included four open adits and an open pit with a 30-foot highwall. Additionally, the mill building was in a state of collapse.

Free Coin/Red Cloud PA# 20-134  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 06/29/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-134-SE1	0.6 JX	7.2 J	662	0.7 J	7.0 J	14.6 J	41.4 J	17500	1.03	500 J	9.0 JX	48.2	6.1 U	44.1 J	NR
20-134-SE2	1.0 UJX	9.1 UJ	254	0.9 UJ	10.5 J	32.8 J	54.3 J	29500	0.51	712 J	16.8 JX	40.9	10.2 U	134 J	NR
20-134-SE3	1.3 UJX	12.0 UJ	378	3.5 J	197 J	13.9 J	1150 J	31000	1.59	20800 J	70.2 JX	48.9	13.3 U	161 J	NR
20-134-WR1	4.8 JX	9.3 J	164	0.6 J	9.1 J	10.1 J	61.4 J	23600	2.44	565 J	6.7 JX	171	5.2 U	38.1 J	NR
20-134-WR5	3.3 JX	37.4 J	40.0	0.5 UJ	5.8 J	13.6 J	104 J	37900	2.08	322 J	10.8 JX	137	13.9	37.7 J	NR
BACKGROUND	1.3 JX	7.8 J	209	0.4 UJ	6.2 J	12.1 J	10.9 J	15300	0.06	797 J	9.4 JX	6.0 U	5.0	40.2 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
20-134-WR1	0.42	13.1	20.7	7.61	0.02	0.21	0.19	6.56	14.2
20-134-WR5	0.17	5.31	2.29	-3	0.04	0.01	0.12	0.31	1.97

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-134-GW1	0.12 U	2.3 JX	25.4	2.6 U	8.7 U	4.7 U	4.6 U	6040	0.11 U	1320	8.0 U	1.6	29.4 U	4.5 U	329
20-134-SW1	0.12 U	2.0 JX	43.6	2.6 U	8.7 U	4.7 U	5.6	74.3	0.11 U	9.4	8.0 U	1.5	29.4 U	4.5 U	195
20-134-SW2	0.12 U	1.3 UJ	50.6	2.6 U	8.7 U	4.7 U	4.6 U	480	0.11 U	29.1	8.0 U	1.3	29.4 U	7.4	185
20-134-SW3	0.12 U	1.5 JX	30.2	2.6 U	8.7 U	4.7 U	10.3	212	0.11 U	81.2	8.0 U	1.3	29.4 U	8.1	167

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-134-GW1	401	<5.0	184	0.07	NR
20-134-SW1	233	<5.0	67	0.12	NR
20-134-SW2	191	<5.0	41	<0.05	NR
20-134-SW3	241	<5.0	143	<0.05	NR

LEGEND

SE1 - Downstream 50' of hot melting pond in First Chance Gulch.

SE2 - Upstream in First Chance Gulch.

SE3 - Side upgradient of WR5 in unnamed tributary.

WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.

WR5 - Grab sample of subsample WR5.

BACKGROUND - From the Free Coin/Red Cloud Mine (20-134-SE1).

GW1 - Discharge associated with Adit #1; discharge flows 20' over dump material and discharges into First Chance Gulch.

SW1 - Same as sample 20-134-SE1.

SW2 - Same as sample 20-134-SE2.

SW3 - Same as sample 20-134-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Maxville Tailings/  
Londonderry  
Legal Description: T 8 N R 13 W  
Mining District: Maxville  
Latitude: N 46° 28' 27"  
Longitude: W 113° 14' 33"  
Land Status: Private/Public  
Quad: Maxville  
Inspectors: M. Babits, S. Babits/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Granite  
Section(s): SW 1/4, NW 1/4, NW 1/4, Sec. 4  
Mine Type: Hardrock/Ag, Au  
Primary Drainage: Flint Creek  
USGS Code: 17010202  
Secondary Drainage: Boulder Creek  
Date Investigated: September 9, 1993  
P.A. # 20-209

- The volume of tailings associated with this site was estimated to be approximately 10,550 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 1,480 to 4,260 mg/kg      Cadmium: 4.9 to 6.1 mg/kg  
Zinc: 708 to 898 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 8,400 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 1,340 to 1,790 mg/kg      Antimony: 124J to 135J mg/kg  
Zinc: 151 to 205 mg/kg
- One discharging adit, associated with WR-2, was identified at the site. The pH measurement in the adit discharge was 7.3. MCLs for arsenic and cadmium were exceeded in the adit discharge. Additionally, acute and chronic aquatic life criteria were exceeded for arsenic and zinc, and chronic aquatic life criteria were exceeded for iron and cadmium.
- Flint Creek was flowing directly adjacent to WR-1 and WR-2. An observed release to Flint Creek (sediment) was documented for mercury. Surface water samples were not collected due to extremely high flow and likely excessive dilution.
- A potentially hazardous wooden ore chute was identified at the site.

Maxville/Londonderry PA# 20-209  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-209-SE-1	214	975 J	1.3	3.32 J	4.87	64.4 J	8310	0.591	5280 J	3.3 U	246	13.3 J	863	NR
20-209-SE-2	196	1030 J	1.5	3.19 J	3.03	61.9 J	6950	17.9	5270 J	2.6 U	217	16.5 J	795	NR
20-209-TP-1	4260	150 J	4.9	1.88 U	1.33 U	30 J	10500	0.45	245 J	2.46 U	523	151 J	898	NR
20-209-TP-2	1480	187 J	6.1	11.5 J	10.1	117 J	22900	0.284	697 J	11.6	190	20.7 J	708	NR
20-209-WR-1	1790	180 J	0.5	1.6 U	1.13 U	14.4 J	8000	0.41	8.47 J	2.09 U	760	124 J	151	NR
20-209-WR-2	1340	116 J	0.6	1.57 U	1.55	15.3 J	7240	0.826	9.4 J	2.1	1120	135 J	205	NR
BACKGROUND	76.3	329	1.6	6.18	6.06	116	11700	1.33 J	1530 J	6.77	85.8	33.3	47.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. %
20-209-TP-1	0.42	13.1	2.19	-11	0.02	0.09	-0.62
20-209-TP-2	0.69	21.6	36.5	14.9	0.02	<0.01	36.5
20-209-WR-1	0.08	2.5	0.28	-2.2	0.01	<0.01	0.28
20-209-WR1-DUP	0.07	2.19	0.15	-2	0.01	0.01	-0.16
20-209-WR-2	0.1	3.12	0.74	-2.4	0.01	0.01	0.43

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-209-SW-1	2350 JX	28.1	5.57	9.7 U	6.83 U	2	11600	0.12 U	1090	25.9	2.15	30.7 UJX	2630	251

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-209-SW-1	392	3.9	137	0.11	NR

LEGEND

SE1 - 150 feet upgradient from waste rock dump 2.  
SE2 - 200 feet downgradient from waste rock dump 1.  
TP1 - Composite of subsamples TP1A-A, 1A-B, 2A-A, and 2A-B.  
TP2 - Composite of subsamples TP1A-C and 1B-B.  
WR1 - Composite of subsamples WR1, 2A, 2B, and 3.  
WR2 - Sample of the WR3 subsample.  
WR1-DUP - Duplicates of 20-209-WR-1.  
BACKGROUND - From the Combination Mine.  
(20-009-SS-1)  
SW1 - Adit discharge at waste rock dump 2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Banner Tailings</u>	County: <u>Granite</u>
Legal Description: T <u>4N</u> R <u>16W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 36</u>
Mining District: <u>Moose Lake</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 03' 04"</u>	Primary Drainage: <u>Middle Fork Rock Creek</u>
Longitude: <u>W 113° 32' 04"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Middle Fork Rock Creek</u>
Quad: <u>Moose Lake</u>	Date Investigated: <u>June 21, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>20-175</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 2,500 cubic yards. The following elements were elevated at least three times background:

Arsenic : 155J mg/kg	Copper: 65.1 mg/kg
Mercury: 1.46JX mg/kg	Lead: 898 mg/kg
Antimony: 220J mg/kg	Cyanide: 0.265 mg/kg
- Tailings were recently dozed and were mostly enclosed in a basin with no apparent outlet; however, there was no impoundment structure and the tails were unvegetated.
- The volume of waste rock associated with this site was estimated to be 15,000 cubic yards. The following elements were elevated at least three times background:

Arsenic : 140J mg/kg	Copper: 114 mg/kg
Lead: 424 mg/kg	Antimony: 125J mg/kg
- The waste rock dumps were being undercut by and actively eroded into the Middle Fork Rock Creek. No observed releases or exceedances of drinking water standards or aquatic life criteria were documented during this investigation.
- No adit discharges, seeps or springs were observed. No hazardous structures, mine openings, or highwalls were present.

**Banner PA# 20-175**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/21/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-175-SE-1	11 J	81.8	0.6 U	1.5 U	5.8	8.2	4660	0.055 JX	88	4	6 U	4 UJ	22	NR
20-175-SE-2	7 J	102	0.7 U	2.3	6.8	11.7	5580	0.052 JX	121	6	14	5 UJ	32	NR
20-175-TP-1	155 J	38.1	1.1	1.3 U	1 U	65.1	3990	1.46 JX	7.8	2 U	898	220 J	36	0.265
20-175-WR-1	140 J	84.6	0.5	1.2	0.9 U	114	17800	1 JX	223	4	424	125 J	35	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
20-175-TP-1	0.04	1.25	0.93	-0.3	0.03	<0.01	0.01	0	0.93
20-175-WR-1	0.23	7.19	1.9	-5.3	0.22	<0.01	0.02	0	1.9

**LEGEND**

SE1 - Upstream of dumps.  
SE2 - Downstream of dumps.  
TP1 - Composite of subsamples TP1A through 1D.  
WR1 - Composite of subsamples WR1A through 1E.  
BACKGROUND - From the Montana Price Mines (41-004-SS-1)



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Old Dominion Mine</u>	County: <u>Granite</u>
Legal Description: <u>T 4N R 16W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 36</u>
Mining District: <u>Moose Lake</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 02' 55"</u>	Primary Drainage: <u>Middle Fork Rock Creek</u>
Longitude: <u>W 113° 31' 30"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Middle Fork Rock Creek</u>
Quad: <u>Moose Lake</u>	Date Investigated: <u>June 21, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>20-180</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 5,600 cubic yards. The following elements were elevated at least three times background:  
Copper: 28.5 mg/kg                      Mercury: 0.445JX mg/kg  
Lead: 103 mg/kg                      Cyanide: 0.282 mg/kg
- Tailings were within an enclosed basin with no apparent outlet or impoundment structure and the tailings were mostly (75%) revegetated
- The volume of waste rock associated with this site was estimated to be 6,700 cubic yards. The following element was elevated at least three times background:  
Lead: 68 mg/kg
- One observed release of lead was documented in downgradient well. No exceedances of drinking water standards or aquatic life criteria were documented during this investigation.
- No adit discharges, seeps or springs were observed. Two hazardous structures were on site: the mill building and an old generator building. No mine openings, or highwalls were present.

Old Dominion PA# 20-180  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/21/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-180-TP-1	13 J	225	0.6 U	1.4 U	4	28.5	6080	0.445 JX	29	3	103	4 UJ	9	0.282
20-180-WR-1	6 J	22.4	0.5 U	1.2 U	1 U	6.7	2280	0.195 JX	8.2	3	68	4 UJ	8	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	ACID BASE POTENT. v/1000r	SULFATE %	PYRITIC %	SULFUR %	ACID BASE %	SULFUR v/1000r	ACID BASE v/1000r	POTENT. v/1000r	ACID BASE v/1000r
20-180-TP-1	0.01	0.31	1.06	0.75	0.01	<0.01	<0.01	0	0	0.31	1.06	1.06
20-180-WR-1	0.01	0.31	2.58	2.26	<0.01	0.01	<0.01	0.31	0.31	2.26	2.26	2.26

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-180-GW-1	0.98 U	116	2.57 U	9.7 U	6.83 U	55.5	15.3	0.038 U	4.08 U	12.7 U	0.38 U	30.7 U	12.8	101
20-180-GW-2	0.98 U	313	2.57 U	9.7 U	6.83 U	8.93	102	0.038 U	4.3	12.7 U	0.38 U	30.7 U	8.43	93.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-180-GW-1	127	< 5.0	5	0.08	NR
20-180-GW-2	139	< 5.0	6	0.09	NR

LEGEND

TP1 - Composite of subsamples TP1A-A, 1B-A, 1B-B, 1C-A, and 1D-A.

WR1 - Composite of subsamples WR1A, 1B, 2A, 2B, and 2C.

BACKGROUND - From the Montana Prince Mine (41-004-SS-1).

GW1 - Petersen residence (upgradient) West of site.  
GW2 - Floyd's residence (downgradient) North of site.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bi-Metallic/Old Red</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 33</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Ag, Au, Pb</u>
Latitude: <u>N 46° 18' 44"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 16' 16"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Douglas Creek</u>
Quad: <u>Fred Burr Lake/Philipsburg</u>	Date Investigated: <u>June 22, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>20-002</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The mill tailings associated with this site were slurried in flumes down a dry tributary to Douglas Creek, and were probably the source of the Douglas Creek Tailings. The total volume of tailings was roughly estimated at 40 cubic yards, but may be significantly more. The tailings in the drainage were 90% revegetated, while those at the mill site were not. The following elements were elevated at least three times background:

Arsenic: 3,270 mg/kg	Cadmium: 3.2 mg/kg
Copper: 126 mg/kg	Mercury: 1.5 mg/kg
Manganese: 3,760	Lead: 667J mg/kg
Antimony: 112J mg/kg	Zinc: 469 mg/kg
- The volume of waste rock associated with this site was estimated to be 62,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2,860 to 8,230J mg/kg	Cadmium: 1.7 mg/kg
Copper: 72.5J mg/kg	Mercury: 2.02 mg/kg
Lead: 667J mg/kg	Antimony: 78J to 79J mg/kg
Zinc: 387 to 568 mg/kg	
- The Bimetallic site was intimately associated with the Granite Mine site to the east. No real boundary exists separating the two sites. For the investigation, the access road was the dividing line between the two.
- No observed releases, exceedances of drinking water standards or aquatic life criteria were documented at this site.
- No discharging adits, springs or seeps were observed.
- No hazardous structures or openings existed at the site.

**Bimetallic/Old Red PA# 20-002**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/22/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-002-TP-1	3270	201	3.2	2.4	2.3	126 J	18100	1.5	3760	15 J	667 J	112 J	469	0.292 U
20-002-WR-1	8230 J	108	0.6 U	1.8	1.1	32.4	26900	0.801 JX	179	2 U	386	79 J	387	NR
20-002-WR-2	2860	114	1.7	3.9	2.8	72.5 J	20200	2.02	2200	12 J	413 J	78 J	568	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000	NEUTRAL POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT. 1/1000
20-002-TP-1	0.19	5.94	5.62	-0.3	0.12	<0.01	0.07	0	5.62
20-002-WR-1	0.74	23.1	-2.1	-25	0.59	0.01	0.14	0.31	-2.36
20-002-WR-2	1.17	36.6	5.19	-31	0.32	0.62	0.23	19.4	-14.2

**LEGEND**

TP1 - Composite of subsamples TP1, 2, and 3.  
 WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A and 2B.  
 BACKGROUND - From the Granite Mountain Mine (20-110-SS1)

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Douglas Creek</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 31</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Tailings/Au, Ag, Pb</u>
Latitude: <u>N 46° 18' 38"</u>	Primary Drainage: <u>Douglas Creek</u>
Longitude: <u>W 113° 15' 50"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>None</u>
Quad: <u>Philipsburg</u>	Date Investigated: <u>June 23, 1993</u>
Inspectors: <u>Bullock, Flammang, Lasher</u>	P.A. # <u>20-003</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 295,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1,520 to 2,950 mg/kg	Manganese: 4,270 to 13,700 mg/kg
Cadmium: 2.4 to 5.7 mg/kg	Nickel: 44J to 56J mg/kg
Copper: 63.1J to 181J mg/kg	Lead: 336J to 1,430J mg/kg
Mercury: 1.06 to 16.4 mg/kg	Antimony: 115J to 224J mg/kg
Zinc: 464 to 2,030 mg/kg	
- There was no waste rock observed at this site during the investigation.
- No adit discharges, filled shafts, springs, or seeps were observed at the site during the investigation.
- The site was situated directly in the intermittent Douglas Creek drainage; surface water was flowing through and under the tailings piles at the time of this investigation. Three surface water samples were collected from Douglas Creek (upstream, center of site, and downstream). Observed releases to Douglas Creek were documented for arsenic, manganese, lead, and zinc. The MCL for arsenic was exceeded and was directly attributable to the site. The acute and chronic aquatic life criteria for copper and zinc, and the chronic aquatic life criteria for mercury and lead were exceeded in all of the samples, and therefore not directly attributable to the site. Observed releases for arsenic, manganese, and nickel were also documented in the stream sediment samples. The upstream sediment mercury concentration was significantly elevated at 22.5 mg/kg.
- One potentially hazardous adit opening was identified approximately 0.5 miles above this site. Both tailings impoundments had unstable slopes down to the stream, and both tailings dams had been breached.

Douglas Creek PA# 20-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/23/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-003-SE-1	900	136	3.3	5.5	2.8	95.1 J	12300	22.5	3030	14 J	390 J	46 J	763	NR
20-003-SE-2	1260	128	2.3	5.1	4.1	75.1 J	13400	3.84	3390	13 J	403 J	81 J	535	NR
20-003-SE-3	2140	265	4.7	7	6.4	129 J	18500	3.78	10600	44 J	535 J	135 J	1030	NR
20-003-TP-1A	3710	491	5.7	2.4	4.5	181 J	13700	16.4	13700	56 J	1430 J	224 J	2030	NR
20-003-TP-1B	2710	274	3.8	1.4 U	2.7	75.1 J	8380	3.17	11500	44 J	556 J	186 J	985	NR
20-003-TP-2A	2140	146	2.7	3.7	3.5	118 J	14700	1.06	4270	18 J	602 J	125 J	464	NR
20-003-TP-2BA	1520	185	2.4	3.7	3.5	63.1 J	13700	1.52	4270	16 J	336 J	115 J	496	NR
20-003-TP-2BB	2950	309	4	2.4	3.8	148 J	20400	1.44	7050	27 J	974 J	156 J	817	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

Acid/Base Accounting

Cation Exchange Capacity

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE %	SULFUR ACID BASE POTENT. %	milliequivalents/100g
20-003-TP1A	0.29	9.06	37.5	28.4	0.05	0.16	5	32.5	4.05
20-003-TP1B	0.29	9.06	26.5	17.4	0.13	0.11	3.44	23.1	1.29
20-003-TP2A	0.18	5.62	6.24	0.62	0.12	0.01	0.31	5.93	3.38
20-003-TP2B-A	0.11	3.44	14.4	11	0.02	0.03	0.94	13.5	3.13
20-003-TP2B-B	0.38	11.9	15.6	3.75	0.26	0.06	1.87	13.8	5.22

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
20-003-SW-1	24.3	28.5	2.57 U	9.7 U	6.83 U	5.43	63.7	0.11	16.1	12.7 U	1.33	30.7 U	51.9	24.3
20-003-SW-2	72.2	28.2	2.57 U	9.7 U	6.83 U	5.9	270	0.25	557	12.7 U	4.1	30.7 U	115	29.1
20-003-SW-3	87.4	25.3	2.57 U	9.7 U	6.83 U	6.37	316	0.17	807	12.7 U	5.55	30.7 U	249	33.1

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-003-SW-1	81	< 5.0	10	< 0.05	NR
20-003-SW-2	95	< 5.0	15	< 0.05	NR
20-003-SW-3	98	< 5.0	20	0.06	NR

SE1 - Located approx. 100' upstream from the east end of tailings pond 2.

SE2 - Approx. 70' downstream of tailings pond 2, below confluence of two stream channels.

SE3 - Approx. 100' below tailings pond 1.

TP1A - Composite of subsamples TP1A-A through 1A-E.

TP1B - Composite of subsamples TP1B-A through 1B-D.

TP2A - Composite of subsamples 2A-A through 2A-F.

TP2B-A - Composite of subsamples TP2B-A and 2B-B.

LEGEND

TP2B-B - Composite of subsamples TP2B-C and 2B-D.

BACKGROUND - From the Granite Mountain Mine (20-110-S5-1).

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW3 - Same as sample SE3.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Algonquin</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 30</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Ag, Au, Pb, Zn, Mn</u>
Latitude: <u>N 46° 19' 40"</u>	Primary Drainage: <u>Douglas Creek</u>
Longitude: <u>W 113° 15' 57"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Frost Creek</u>
Quad: <u>Philipsburg</u>	Date Investigated: <u>June 23, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>20-005</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 52,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 99 to 1,420 mg/kg	Cadmium: 10 to 35.4 mg/kg
Chromium: 21.9 mg/kg	Copper: 69.1 to 1,570 mg/kg
Iron: 48,800 mg/kg	Mercury: 1.02 mg/kg
Manganese: 4,590 to 9,850 mg/kg	Nickel: 51 mg/kg
Lead: 747 to 1,270 mg/kg	Antimony: 17 to 42 mg/kg
Zinc: 4,890 to 15,400 mg/kg	
- The waste rock dumps were mostly unvegetated and WR-1 had been undercut, which resulted in unstable highwalls on the dump.
- Frost Creek flowed through the site. No observed releases or exceedances of drinking water standards were documented during this investigation. Aquatic life criteria for zinc (both acute and chronic) were exceeded both up- and downstream in Frost Creek. No adit discharges, seeps or springs were observed.
- Two hazardous structures were onsite: one older mine office building and an old shed. One mine opening was onsite: a shaft fenced by Department of State Lands, but was still open and hazardous (headframe has collapsed into shaft).
- Observed probable asbestos insulation on the boiler in the mine building.

**Algonquin PA# 20-005**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/23/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-005-SE-1	14	80.4	0.5 U	10.6	6.1	6.7 J	16500	0.025	591	2 J	98 J	4 U	238	NR
20-005-SE-2	13	119	1.2	8.3	3.2	9.8 J	10300	0.044	1700	6 J	185 J	4 U	600	NR
20-005-WR-1	99	65.6	10	3.4	6.2	69.1 J	21000	1.02	1540	13 J	747 J	17 J	4890	NR
20-005-WR-2	1420	36.7	34.8	7.3	21.9	1570 J	48800	1.02	4590	28 J	585 J	35 J	15300	NR
20-005-WR-3	776	51.3	35.4	16.9	8.4	690 J	28700	0.354	9850	51 J	1270 J	42 J	15400	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE %	ORGANIC SULFUR %	PYRITIC SULFUR v/1000x	PYRITIC ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
20-005-WR-1	1.28	40	145	105	0.4	0.64	0.24	7.5	137
20-005-WR-2	2.17	67.8	117	48.7	1.05	0.71	0.41	12.8	104
20-005-WR-3	1.53	47.8	408	360	<0.01	1.56	0.61	19.1	389

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
20-005-SW-1	3.19	23.1	2.57 U	9.7 U	6.83 U	1.55 U	104	0.038 U	37.7	12.7 U	0.38 U	30.7 U	56.4	21.3
20-005-SW-2	3.53	24.4	2.57 U	9.7 U	6.83 U	1.55 U	160	0.038 U	44.8	12.7 U	0.38 U	30.7 U	63.1	21.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-005-SW-1	94	< 5.0	8	0.06	NR
20-005-SW-2	75	< 5.0	8	0.05	NR

**LEGEND**

- SE1 - Upstream of site in Frost Creek.  
 SE2 - Downstream from site, 100' in Frost Creek.  
 WR1 - Composite of subsamples WR1A through 1C and WR2A through 2C.  
 WR2 - Composite of subsamples WR3A and 3B.  
 WR3 - Composite of subsamples WR4A through 4C.  
 BACKGROUND - From the Granite Mountain Mine (20-110-SS-1).
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Rumsey</u>	County: <u>Granite</u>
Legal Description: <u>T 6N R 13W</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 8</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 17' 32"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 14' 49"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Fred Burr Creek</u>
Quad: <u>Philipsburg/Fred Burr Lake</u>	Date Investigated: <u>June 24, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>20-018</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The mill tailings associated with this site were not impounded but were in the floodplain of Fred Burr Creek and extended at least one mile downstream from the site. The volume of these tailings were estimated at 2,800 cubic yards and were 90% revegetated (naturally). The following elements were elevated at least three times background:  
Arsenic : 520 mg/kg                      Cadmium: 9.3 mg/kg  
Copper: 63.8 mg/kg                      Mercury: 4.7 mg/kg  
Lead: 195 mg/kg                      Zinc: 1,130 mg/kg
- The volume of waste rock associated with this site was estimated to be 22,000 cubic yards. None of the elements analyzed were elevated above three times background.
- An observed release to surface water (Fred Burr Creek) was documented in sediments for arsenic, copper, mercury, lead, and zinc. No exceedances of drinking water standards or aquatic life criteria were documented in Fred Burr Creek.
- One discharging adit had a significant flow (13 gpm). The adit water (SW-2) had a pH of 6.70, an specific conductance of 207 us/cm, and did not exceed drinking water standards; aquatic life criteria for mercury (chronic) was exceeded in the adit discharge.
- The old stone mill foundation could be hazardous. The large (10 by 12 feet) adit was a hazardous mine opening.

Rumsey PA# 20-018  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/24/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-018-SE-1	4	25.3 J	0.5 U	3	2	2.6	8100	0.068 J	93.6 J	3 J	5 U	4 U	11	NR
20-018-SE-3	196	64 J	0.8	4.1	1.2	20.3	12100	5.56 J	758 J	4 J	67	5	277	NR
20-018-TP-1	520	233 J	9.3	10.6	8.4	63.8	31200	4.7 J	1550 J	13 J	195	6	1130	0.304
20-018-WR-1	5	201 J	0.5 U	15.7	6.8	15.8	26300	0.423 J	542 J	8 J	4 U	4 U	52	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x
20-018-TP-1	0.01	0.31	4.27	3.95	0.01	3.95	0.01	0.01	<0.01	0	0.01	0	0	4.27	0	4.27
20-018-WR-1	<0.01	0	46.5	46.5	<0.01	46.5	<0.01	<0.01	<0.01	0	0.02	0	0	46.5	0	46.5

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-018-SW-2	0.98 U	3.63	2.57 U	9.7 U	6.83 U	1.55 U	73.9	0.11	8	12.7 U	0.38 U	30.7 U	7.57 U	80.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-018-SW-2	122	< 5.0	12	0.09	NR

LEGEND

SW2 - Adit discharge.

SE1 - Upstream in Fred Burr Creek - 120 feet.

SE3 - Downstream in Fred Burr Creek - 1/2 mile.

TP1 - Composite of subsamples TP1B-1, 1A-1, and 1C-1.

WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 3A.

BACKGROUND - From the Granite Mountain Mine (20-110-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Scratch All</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 30</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Mn, Pb, Zn, Ag</u>
Latitude: <u>N 46° 19' 53"</u>	Primary Drainage: <u>Camp Creek</u>
Longitude: <u>W 113° 15' 59"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>None</u>
Quad: <u>Philipsburg</u>	Date Investigated: <u>June 22, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>20-019</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during this investigation.
- The volume of waste rock associated with this site was estimated to be approximately 543,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 264 to 377 mg/kg	Nickel: 62J to 95J mg/kg
Cadmium: 9.5 to 33.3 mg/kg	Lead: 1,090J to 2,950J mg/kg
Copper: 166J to 386J mg/kg	Antimony: 28J mg/kg
Mercury: 0.654 to 1.14 mg/kg	Zinc: 4,480 to 17,700 mg/kg
Manganese: 11,700 to 18,700 mg/kg	
- No adit discharges, filled shafts, seeps, or springs were observed at the site during the investigation, and no other surface water was located on or near the site; consequently, no groundwater or surface water samples were collected.
- Four potentially hazardous mine openings were identified at the site including two fenced shafts, one partially blocked adit, and one open adit. A 15 feet tall highwall associated with the pit was also potentially hazardous. Six structures were identified that presented potential safety hazards; and several drums/tanks were located on-site that may contain hazardous materials. Potential asbestos containing materials were also identified on-site.

Scratch All PA# 20-019  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/22/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-019-WR-1	377	80.4	33.3	4	9.3	386 J	14200	1.14	11700	62 J	2950 J	28 J	17700	NR
20-019-WR-2	264	75.5	9.5	6.5	11.1	166 J	18000	0.654	18700	95 J	1090 J	7 J	4480	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected, J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	ACID BASE	POTENT.	ACID BASE	POTENT.	SULFUR	%	SULFUR	ACID BASE	SULFUR	%	SULFUR	ACID BASE	ACID BASE	POTENT.
	%	v/1000r	v/1000r	v/1000r	v/1000r	v/1000r	%	%	%	v/1000r	%	%	%	v/1000r	v/1000r	v/1000r
20-019-WR-1DUP	1.76	55	550	550	495	495	<0.01	2.25	70.3	2.45	2.45	2.45	70.3	479	479	479
20-019-WR-1	1.77	55.3	548	548	492	492	<0.01	2.24	70	2.44	2.44	2.44	70	478	478	478
20-019-WR-2	0.15	4.69	562	562	558	558	<0.01	0.9	28.1	0.81	0.81	0.81	28.1	534	534	534

LEGEND

WR1 - Composite of subsamples WR1A, 1E, and 2.  
WR2 - Composite of subsamples WR1B, 1C, and 1D.  
BACKGROUND - From the Granite Mountain Mine  
(20-110-SS-1).  
WR1DUP - Duplicate of the 20-019-WR-1 sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Trout</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 30</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Au, Ag, Pb Zn</u>
Latitude: <u>N 46° 19' 48"</u>	Primary Drainage: <u>Cliff Gulch</u>
Longitude: <u>W 113° 16' 05"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cliff Gulch</u>
Quad: <u>Philipsburg</u>	Date Investigated: <u>June 21, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>20-062</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 93,000 cubic yards of mostly uncovered tailings on site. The following elements were elevated at least three times background:

Arsenic: 95J to 285J mg/kg	Barium: 1,340 mg/kg
Cadmium: 6.5 to 26.7 mg/kg	Chromium: 24 mg/kg
Copper: 156 to 376 mg/kg	Mercury: 1.83JX mg/kg
Manganese: 16,900 to 19,500 mg/kg	Nickel: 79 to 110 mg/kg
Lead: 946 to 2,780 mg/kg	Antimony: 33J mg/kg
Zinc: 3,090 to 14,500 mg/kg	
  
- There were approximately 1,750 cubic yards of slag on site. The following elements were elevated at least three times background:

Arsenic: 663J mg/kg	Cadmium: 7.2 mg/kg
Chromium: 17.7 mg/kg	Copper: 47.2 mg/kg
Mercury: 0.882JX mg/kg	Manganese: 97,200 mg/kg
Nickel: 387 mg/kg	Zinc: 4,850 mg/kg
  
- There were approximately 18,140 cubic yards of mostly uncovered waste rock on site. The following elements were elevated at least three times background:

Arsenic: 218J to 615J mg/kg	Cadmium: 3.1 to 19.1 mg/kg
Chromium: 14.7 to 30.2 mg/kg	Copper: 38.9 to 323 mg/kg
Mercury: 2.51JX mg/kg	Manganese: 25,800 mg/kg
Nickel: 111 mg/kg	Lead: 3,680 mg/kg
Antimony: 28J mg/kg	Zinc: 1,480 to 11,200 mg/kg
  
- There were no discharging adits, shafts, seeps or springs identified at the site.
  
- There was no surface water on site. The nearest surface water was over 1 mile away; no surface water samples were collected. A dry drainage was identified below the site and its headwaters were in the tailings; hence, there was no upstream sample. A downstream sediment sample was collected.

Trout PA# 20-062  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/22/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Cyanide (mg/Kg)
20-062-SE-1	303 J	2540	21.8	2.7	20.2	274	16800	1.23 JX	28300	131	2900	21 J	11200	NR
20-062-SL-1	663 J	507	7.2	2.6	17.7	47.2	17400	0.882 JX	97200	387	1240	10 J	4850	NR
20-062-TP-1	95 J	547	6.5	1.2 U	8.5	156	8690	0.412 JX	16900	79	946	5 J	3090	NR
20-062-TP-2	285 J	1340	26.7	7.1	24	376	21400	1.83 JX	19500	110	2780	33 J	14500	NR
20-062-WR-1	615 J	215	3.1	4.9	30.2	38.9	19300	0.335 JX	154000	723	198	7 J	1170	NR
20-062-WR-2	218 J	605	19.1	0.8 U	5.8	223	3990	2.51 JX	25900	111	3690	28 J	11200	NR
20-062-WR-3	10 J	39.5	9.8	4.7	14.7	323	15600	0.054 JX	581	12	13	4 UJ	1480	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
20-062-SL-1	<0.01	0	187	187	<0.01	<0.01	0.05	0	187
20-062-SL-1DUP	<0.01	0	177	177	<0.01	0.01	0.05	0.31	177
20-062-TP-1	0.92	28.7	98	69.2	0.22	0.53	0.17	16.6	81.4
20-062-TP-2	2.17	67.8	129	61.4	<0.01	1.88	0.38	58.7	70.4
20-062-WR-1	<0.01	0	469	469	<0.01	<0.01	0.02	0	469
20-062-WR-2	<0.01	0	908	908	<0.01	<0.01	0.02	0	908
20-062-WR-3	1.8	56.2	168	112	0.02	0.77	1.01	24.1	144

Cation Exchange Capacity

FIELD ID	milliequivalents/100g
20-062-SL-1	4.19
20-062-TP-1	0.62
20-062-TP-2	3.79

LEGEND

SE1 - Downgradient sediment sample in Cliff Gulch.  
SL1 - Dark material associated with old mill. Composite of subsamples SL-1, 2A, 2B, and 3.  
TP1 - Composite of subsamples TP1-1A, 2, and 3.  
TP2 - Composite of subsamples TP1-1B, 1C, 1D, and 2D.  
WR1 - Composite of subsamples WR1, 2, and LO#1.  
WR2 - Composite of subsamples WR4A, 4B, 5, and 6.  
WR3 - Sample of the subsample WR3.  
BACKGROUND - From the Granite Mountain Mine (20-110-SS-1).  
SL1DUP - Duplicate of the sample 20-062-SL1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Little Gem  
Legal Description: T 7N R 13W  
Mining District: Philipsburg  
Latitude: N 46° 19' 43"  
Longitude: W 113° 16' 22"  
Land Status: Private  
Quad: Philipsburg  
Inspectors: Flammang, Belanger, West  
Organization: Pioneer Technical Services, Inc.

County: Granite  
Section(s): NE 1/4, SW 1/4, Section 30  
Mine Type: Hardrock/Ag. Au. Pb. Zn  
Primary Drainage: Camp Creek  
USGS Code: 17010202  
Secondary Drainage: Cliff Gulch  
Date Investigated: July 5, 1994  
P.A. # 20-071

- The volume of tailings observed at the site was estimated to be 18,290 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Silver: 53 to 68.5 mg/kg                      Manganese: 29,600 mg/kg  
Cadmium: 15.1 mg/kg                      Lead: 903 to 2,890 mg/kg  
Copper: 145J mg/kg                      Zinc: 2,590 to 9,250 mg/kg
- The volume of waste rock observed at the site was estimated to be 4,810 cubic yards. The waste rock was previously sampled during the 1993 Hazardous Materials Inventory as part of the Trout Mine (20-062) investigation. The following elements were elevated to at least three times the background concentrations:  
Cadmium: 9.8 mg/kg                      Zinc: 1,480 mg/kg  
Copper: 323 mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Intermittent Cliff Gulch (dry during investigation) flows adjacent to the site on the north side. Sediment samples were collected from Cliff Gulch; however, no observed releases were documented due to upgradient impacts from the Trout site.
- Potential safety hazards observed at the site included one open adit, a collapsing headframe, and two collapsing wooden structures.

Little Gem PA# 20-071  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-062-WR3	NR	10 J	39.5	9.8	4.7	14.7	323	15600	0.054 JX	581	12	13	4 UJ	1480	NR
20-071-SE1	60.4	225 J	1690	16.4 J	1.8	7.9 J	168 J	13500	0.75 J	20900	2.3 JX	2240	18.2 JX	9560	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	22500	5.0 JX	1990	16.1 JX	8940	NR
20-071-TP1	53.0	309 J	808	3.8 J	1.9 U	7.8 J	111 J	24500	1.18 J	6510	3.4 JX	903	6.4 UJX	2590	2.28
20-071-TP2	68.5	189 J	846	15.1 J	2.5	8.7 J	145 J	12200	1.03 J	29600	1.6 UJX	2890	18.8 JX	9250	1.23
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	3830	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE SULFUR v/1000r	NEUTRAL POTENT v/1000r	SULFUR ACID BASE POTENT v/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000r	SULFUR ACID BASE POTENT v/1000r
20-071-TP1	2.08	64.4	25.6	-39	0.78	1.03	0.25	32.2	-6.54
20-071-TP2	1.33	41.5	146	104	0.19	0.96	0.18	30.0	116

LEGEND

SEI - Upgrade of Little Gem, downgradient of Trout, approx. 15 feet low of waste rock (Trout) is valley.  
20-073-SE2 - Upgrade of Wager 02, downgradient of Little Gem and White Horse Mines.  
TP1 - Composite of subsamples TP2A-1 and 2A-3.  
TP2 - Composite of subsamples TP2A-1 through 2A-5.  
20-062-WR3 - One sample of the WR3 subsample, from the Trout mine.  
BACKGROUND - From the Little Gem mine (20-071-SE1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Wenger No. 2  
Legal Description: T 7N R 13W  
Mining District: Philipsburg  
Latitude: N 46° 19' 10"  
Longitude: W 113° 16' 47"  
Land Status: Private  
Quad: Philipsburg  
Inspectors: Flammang, Belanger, West  
Organization: Pioneer Technical Services, Inc.

County: Granite  
Section(s): SW 1/4, SW 1/4, Section 30  
Mine Type: Hardrock/Ag. Au, Pb, Zn  
Primary Drainage: Camp Creek  
USGS Code: 17010202  
Secondary Drainage: Cliff Gulch  
Date Investigated: July 5, 1994  
P.A. # 20-073

- The volume of tailings observed at the site was estimated to be 86,635 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 52.4 to 70.6 mg/kg	Arsenic: 520J mg/kg
Barium: 3,880 to 7,050 mg/kg	Cadmium: 10J to 12.4J mg/kg
Copper: 187J to 644J mg/kg	Manganese: 16,000 mg/kg
Lead: 1,920 to 2,340 mg/kg	Zinc: 6,820 to 7,860 mg/kg
  
- The volume of waste rock observed at the site was estimated to be 8,350 cubic yards. The following elements were elevated to at least three times the background concentrations:

Barium: 1,940 mg/kg	Copper: 330J mg/kg
Manganese: 36,900 mg/kg	Zinc: 2,500 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
  
- Intermittent Cliff Gulch (dry during investigation) flows adjacent to the site on the northeast side. Sediment samples were collected from the Cliff Gulch drainage; however, no observed releases were documented.
  
- Potential safety hazards observed at the site included two open adits, a collapsing loadout structure, and a collapsing cabin.

Wenger No. 2 PA# 20-073  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-073-SE1	28.9	150 J	1580	8.6 J	1.6 U	6.4 J	123 J	9140	0.70 J	1.4 UJX	1430	7.1 JX	5310	NR
20-073-SE2	55.4	252 J	2120	15.9 J	2.0	9.6 J	191 J	14700	0.74 J	5.0 JX	1990	16.1 JX	8940	NR
20-073-TP1	70.6	198 J	7050	10.0 J	1.9 U	7.3 J	644 J	9080	0.78 J	7.5 JX	2340	23.4 JX	7860	2.28
20-073-TP2	52.4	520 J	3880	12.4 J	2.2	13.2 J	187 J	14300	1.22 J	4.6 JX	1920	24.5 JX	6820	1.23
20-073-WR1	23.5	42.2 J	1940	3.8 J	2.2	4.5 J	330 J	7190	0.43 J	1.3 UJX	272	4.8 UJX	2500	NR
BACKGROUND	8.6	169 J	484	1.6 J	6.6	12.6 J	44.4 J	15600	0.63 J	7.3 JX	192	6.7 UJX	440	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE V/1000	NEUTRAL POTENT V/1000	SULFUR ACID BASE POTENT V/1000	SULFUR %	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE V/1000	SULFUR ACID BASE POTENT V/1000
20-073-TP1	0.89	27.8	89.6	61.8	0.23	0.18	0.59	0.07	18.4	71.2
20-073-TP2	1.09	34.1	64.8	30.7	0.20	0.16	0.71	0.20	22.2	42.6
20-073-WR1	0.01	0.31	599	599	<0.01	<0.01	<0.01	0.08	0.00	599

LEGEND

SE1 - Downstream of culvert sill on west side of creek.  
SE2 - Upstream of Wenger #2, downstream of Little Glen and White Horse Mine west of road in drainage.  
TP1 - Grab sample of the TP3A-A subsample.  
WR1 - Composite of subsamples WR1A through 1C, 2A, 2B, and 3.  
BACKGROUND - From the Little Glen Mine (20-071-SE1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Granite Mountain</u>	County: <u>Granite</u>
Legal Description: <u>T 7 N R 13 W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 32</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Ag, Au, Pb</u>
Latitude: <u>N 46° 18' 55" to 19' 05"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 14' 20" to 14' 50"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Douglas Creek</u>
Quad: <u>Fred Burr/Philipsburg</u>	Date Investigated: <u>June 22, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>20-110</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 8,280 cubic yards. Tailings were also observed in a dry stream bed extending approximately 1 mile downstream to Douglas Creek. The following elements were elevated at least three times background:

Arsenic: 55,000J mg/kg	Mercury: 4.58JX mg/kg
Cadmium: 38.3 mg/kg	Lead: 1,240 mg/kg
Copper: 1,560 mg/kg	Antimony: 224J mg/kg
Iron: 298,000 mg/kg	Zinc: 7,920 mg/kg
Cyanide: 0.737 mg/kg	
- The volume of waste rock associated with this site was estimated to be approximately 53,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3,420 mg/kg	Lead: 315 mg/kg
Copper: 52.9 mg/kg	Antimony: 28 mg/kg
Mercury: 1.67 JX mg/kg	Zinc: 289 mg/kg
- No flowing adits or filled shafts, were observed on or adjacent to the site during the investigation; no groundwater or surface water samples were collected.
- The fenced shaft was open and potentially hazardous. A highwall located near the top of the hill was unstable and potentially hazardous.

**Granite Mountain PA# 20-110**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/22/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-110-TP-2	55000 J	98.4	38.3	4.9	10.4	1560	298000	4.58 JX	1990	11	1240	224 J	7920	0.737
20-110-WR-1	3420 J	232	1.3	4.3	1.8	52.9	21200	1.67 JX	1090	6	315	28 J	289	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		ACID BASE		POTENT	
	SULFUR	ACID BASE	POTENT	1/1000x	SULFUR	ACID BASE	POTENT	1/1000x	SULFUR	ACID BASE	POTENT	1/1000x	SULFUR	ACID BASE	POTENT	1/1000x	SULFUR	ACID BASE	POTENT	1/1000x
20-110-TP-2	0.72	22.5	-2.3	-25	0.1	0.1	0.1	0.1	0.47	0.15	0.15	0.15	14.7	14.7	-17	-17	0	0	2.02	2.02
20-110-WR-1DUP	0.43	13.4	2.02	-11	0.34	0.34	0.34	0.34	<0.01	0.09	0.09	0.09	0	0	0	0	0.31	0.31	20.6	20.6
20-110-WR-1	0.41	12.8	2.37	-10	0.31	0.31	0.31	0.31	0.01	0.09	0.09	0.09	0.31	0.31	0.31	0.31	0.31	0.31	20.6	20.6

**LEGEND**

TP2 - Sample of the TP2 subsample.  
 WR1 - Composite of WR1A, 1B, 1C, 1D, and 1E.  
 BACKGROUND - From Granite Mountain Mine (20-110-SS-1).  
 WR1DUP - Duplicate of sample 20-110-WR-1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>True Fissure</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 13W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 30</u>
Mining District: <u>Philipsburg</u>	Mine Type: <u>Hardrock/Ag. Mn. Pb. Zn</u>
Latitude: <u>N 46° 19' 32"</u>	Primary Drainage: <u>Douglas Creek</u>
Longitude: <u>W 113° 16' 00"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Camp Creek</u>
Quad: <u>Philipsburg</u>	Date Investigated: <u>June 23, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>20-111</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 137,360 cubic yards. The following elements were elevated at least three times background:

Arsenic : 502 mg/kg	Cadmium: 2.3 to 3.6 mg/kg
Copper: 43.4J to 43.7J mg/kg	Manganese: 34,900 mg/kg
Nickel: 142J mg/kg	Lead: 347J to 1,140J mg/kg
Zinc: 1,730 to 2,420 mg/kg	
- The waste rock dumps were undercut for use as fill material, and resulted in unstable highwalls on WR-4. A residence was located at the base of WR-1.
- No observed releases or exceedances of drinking water standards or aquatic life criteria were documented during this investigation. No adit discharges, seeps or springs were observed.
- Two hazardous structures were on site: one older building and an old covered tramway. Two mine openings were on site: an adit closed by Department of State Lands (DSL), and a shaft fenced by DSL but still open.

True Fissure PA# 20-111  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/23/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-111-WR-1	74	88.3	3.6	3	6.1	43.4 J	6960	0.244	34900	142 J	347 J	8 J	2420	NR
20-111-WR-2	502	227	2.3	6.2	4.4	43.7 J	37800	1.88	342	2 U	1140 J	5 J	1730	NR
BACKGROUND	25 J	286	0.5 U	9.8	4.6	9	13900	0.161 JX	1230	11	9	4 UJ	41	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		SULFUR		ORGANIC		PYRITIC		SULFUR		SULFUR	
	SULFUR %	ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	ACID BASE POTENT. v/1000x	SULFUR %	SULFUR %	SULFUR %	ACID BASE v/1000x	ACID BASE v/1000x	ACID BASE v/1000x	SULFUR %	SULFUR %	SULFUR %	ACID BASE v/1000x	ACID BASE v/1000x	ACID BASE v/1000x	ACID BASE v/1000x	POTENT. v/1000x
20-111-WR-1	0.34	10.6	595	584	<0.01	0.44	0.34	13.7	581		0.14	0.34	13.7	581		0.19		
20-111-WR-2	0.75	23.4	1.44	-22	0.57	0.04	0.14	1.25	0.19									

LEGEND

WR1 - Composite of subsamples WR1A through 1C, 4A, and 4B.  
WR2 - Composite of subsamples WR2A and 3A.

BACKGROUND - From the Granite Mountain Mine (20-110-SS-1)

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Nonpareil</u>	County: <u>Granite</u>
Legal Description: <u>T 8 N R 12 W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 32</u>
Mining District: <u>South Boulder</u>	Mine Type: <u>Hardrock/Pb, Ag, Zn, Cu</u>
Latitude: <u>N 46° 23' 53"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 08' 20"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Boulder Creek</u>
Quad: <u>Maxville</u>	Date Investigated: <u>September 8, 1993</u>
Inspectors: <u>M. Babits, S. Babits/Pierson</u>	P.A. # <u>20-012</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 18,475 cubic yards of tailings on site. The following were elevated at least three times background:

Arsenic: 360 to 697 mg/kg	Barium 433 mg/kg
Cadmium: 23.1 to 45.8 mg/kg	Copper: 159 to 316 mg/kg
Mercury: 1.22 mg/kg	Lead: 2,640 to 3,110 mg/kg
Antimony: 243J to 282J mg/kg	Zinc: 3,260 to 12,100 mg/kg
Cyanide: 0.395 to 0.541 mg/kg	
  
- There were approximately 3,200 cubic yards of uncovered waste rock. The following were elevated at least three times background:

Arsenic: 2,330 mg/kg	Copper: 863J mg/kg
Iron: 176,000 mg/kg	Lead: 5,720 mg/kg
Antimony: 116J mg/kg	Zinc: 3,310 mg/kg
  
- There were no discharging adits, filled shafts, seeps, or springs identified at the site.
  
- Boulder Creek was flowing approximately 200 feet west of the site. Water which flowed directly through the tailings discharged into Boulder Creek. An observed release to Boulder Creek was documented for copper; however, no MCLs or acute or chronic aquatic life criteria were exceeded that were attributable to the site.

Nonparell PA# 20-012  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-012-SE-1	54.1	28.9 J	4.6	3.37 J	3.23	42.7 J	7660	0.751	195 J	6.97	97.2	6.1 UJ	1020	NR
20-012-SE-2	177	139 J	7.9	5.76 J	5.57	69.8 J	18400	0.719	702 J	11.7	754	42.5 J	1380	NR
20-012-TP-1	360	433 J	23.1	1.84 U	2.16	159 J	14900	1.22	9.66 J	2.13 U	3110	282 J	3260	0.395
20-012-TP-2	697	319 J	45.8	8.89 J	4.09	316 J	29700	0.169	198 J	42.4	2640	243 J	12100	0.541
20-012-WR-1	2330	111 J	0.5 U	2.02 J	12.8	863 J	176000	1.78	119 J	5.85	5720	116 J	3310	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR v/1000	ACID BASE v/1000	NEUTRAL POTENT v/1000	SULFUR ACID BASE POTENT v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT v/1000
20-012-TP-1	0.84	26.2	1.51	-25	0.63	0.06	0.15	1.87	55	-0.36
20-012-TP-2	2.65	82.8	11.7	-71	0.6	1.76	0.29	55	0	-43.3
20-012-WR-1	0.53	16.6	-0.3	-17	0.51	<0.01	0.02	0	0	-0.28

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CAL.C. (mg CaCO3/L)
20-012-SW-1	1.79	15.1	4.27 J	9.7 U	6.83 U	2.9 J	48.2	0.12 UJX	4.08 U	15.1 JX	3.73	30.7 U	16.9 J	76.3
20-012-SW-2	2.86	21	2.57 U	9.7 U	6.83 U	8.87 J	75.3	0.13 JX	4.13	12.7 UX	7	30.7 U	37.1 J	80.6
20-012-SW-3	5.13	32.6	2.57 U	9.7 U	6.83 U	9.4 J	99.4	0.12 UJX	4.13	12.7 UX	6.69	30.7 U	67.2 J	93.8

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-012-SW-1	130	< 5.0	< 5.0	< 0.05	NR
20-012-SW-2	144	< 5.0	< 5.0	< 0.05	NR
20-012-SW-3	155	< 5.0	9	< 0.05	NR

LEGEND

- SE1 - Upgradient (100' from mill building in Boulder Creek. Just upgradient of pump house.  
SE2 - At PFB of pond discharge to Boulder Creek.  
TP1 - Composite of subsamples TP1, TP2, TP3, TP4A, and 4B.  
TP2 - Composite of subsamples TP5A and TP5B.  
WR1 - Composite of subsamples WR1A and WR1B.  
BACKGROUND - From Jackson Park (20-027-SS-1).
- SW1 - Same as SE1.  
SW2 - Same as SE2.  
SW3 - Pond below Tailings Pond 5. (discharges into Boulder Creek)



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Brooklyn</u>	County: <u>Granite</u>
Legal Description: <u>T 7N R 12W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 5</u>
Mining District: <u>South Boulder</u>	Mine Type: <u>Hardrock/Ag. Cu, Pb, Zn, Bismuth</u>
Latitude: <u>N 46° 23' 23"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 112° 07' 30"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Boulder Creek</u>
Quad: <u>Maxville/Pikes Peak</u>	Date Investigated: <u>June 24, 1993</u>
Inspectors: <u>Bullock, Flammang, Lasher</u>	P.A. # <u>20-025</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- Two small impoundments were constructed between the upper mine workings and Boulder Creek. The waste material in these impoundments was either mill tailings or eroded waste rock from the waste rock dumps above. There was no evidence of a mill structure on site, and no historical accounts of milling on-site were found. There were approximately 4800 cubic yards of waste material in the impoundment area. The following elements were elevated at least three times background:

Arsenic: 668 mg/kg	Barium: 861J mg/kg
Cadmium: 99.3 mg/kg	Copper: 2290 mg/kg
Mercury: 10.4J mg/kg	Lead: 5650 mg/kg
Antimony: 747 mg/kg	Zinc: 13,500 mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 38,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 388 to 797 mg/kg	Barium: 435J mg/kg
Cadmium: 38.7 to 41.4 mg/kg	Copper: 121 to 566 mg/kg
Mercury: 2.2J to 20.8J mg/kg	Lead: 2030 to 5510 mg/kg
Antimony: 64 to 644 mg/kg	Zinc: 648 to 9140 mg/kg
  
- There were no discharging adits or shafts associated with this site.
  
- Boulder Creek flowed along the base of the lower workings (WR-5 and WR-6). Observed releases were documented for mercury and lead. MCLs and MCLGs were not exceeded in the samples collected. The chronic aquatic life criteria for lead was exceeded and was be directly attributed to this site.

Brooklyn PA# 20-025  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/24/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
20-025-SE-1	126	318 J	12.6	1.5	1.4	56.5	8610	1.52 J	42.4 J	8 J	537	63	1560	NR
20-025-SE-2	17	40 J	1.2	3.5	2.6	8	9410	0.099 J	278 J	3 J	32	4 U	179	NR
20-025-TP-1	668	861 J	99.3	3.8	5.7	2290	15900	10.4 J	18.2 J	16 J	5650	747	13500	NR
20-025-WR-2	466	294 J	38.7	3.9	3.5	566	17700	12.6 J	43.9 J	15 J	5510	644	9140	NR
20-025-WR-3	797	227 J	3	6.3	3	121	54300	2.2 J	43.4 J	15 J	2030	64	648	NR
20-025-WR-5	388	435 J	41.4	4.4	2.5	213	17600	20.8 J	45.1 J	80 J	3310	184	3180	NR
BACKGROUND	17 JX	122	0.8 J	10.4 J	34.2 J	34.6	23500 J	0.06	1040 J	36 J	38 J	5 U	106 J	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
20-025-TP-1	3.29	103	-1.6	-104	1.08	39	-40.6	
20-025-WR-2	1.81	56.5	5.7	-51	1.03	9.06	-3.36	
20-025-WR-3	5.07	158	42.1	-116	1.57	81.8	-39.7	
20-025-WR-5	1.65	51.5	165	114	1.09	14.4	151	

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
20-025-SW-1	2.88	13.4	2.57 U	9.7 U	6.83 U	2.33	110	0.067	6.2	12.7 U	9.39	30.7 U	7.57 U	51.5
20-025-SW-2	1.24	10.5	2.57 U	9.7 U	6.83 U	1.55 U	25.5	0.038 U	4.43	12.7 U	0.38 U	30.7 U	7.57 U	51.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-025-SW-1	95	< 5.0	5	< 0.05	NR
20-025-SW-2	96	< 5.0	5	< 0.05	NR

LEGEND

- SE1 - Downgradient of waste rock dump 5 and 6.  
SE2 - Upgradient of mine.  
TP1 - Composite of subsamples TP1A-A, 1A-B, 1B-A, 1B-B, and 1B-C.  
WR2 - Composite of subsamples WR1, 2A, 2B, and 2C.  
WR3 - Composite of subsamples WR3A, 3B, 3C, and 3D.  
WR5 - Composite of subsamples WR5A, 5B, 6A, 6B, and 6C.  
BACKGROUND - From the Jackson Park Mine (20-027-SB-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Middle Fork Warm Springs</u>	County: <u>Jefferson</u>
Legal Description: T <u>8 N</u> R <u>2 W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 30, SW 1/4,</u>
Mining District: <u>Alhambra</u>	<u>SW 1/4, Sec. 29</u>
Latitude: <u>N 46° 25' 00"</u>	Mine Type: <u>Hardrock/Unknown</u>
Longitude: <u>W 111° 53' 48"</u>	Primary Drainage: <u>Warm Springs Creek</u>
Land Status: <u>Public</u>	USGS Code: <u>10030101</u>
Quad: <u>Clancy</u>	Secondary Drainage: <u>Middle Fork Warm</u>
Inspectors: <u>Babits, Lasher, Flammang</u>	<u>Springs Creek</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	Date Investigated: <u>August 17, 1993</u>
	P.A. # <u>22-046</u>

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 17,700 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3,010J to 24,000J mg/kg	Cadmium: 5J to 7.3J mg/kg
Mercury: 0.189 to 0.273 mg/kg	Lead: 992J to 2,550J mg/kg
Zinc: 523J to 1,350J mg/kg	Copper: 93.8 to 252 mg/kg
- There were four discharging adits identified at the site. The adit discharges were sampled for field parameters only. The pH measurements ranged from 6.61 to 7.16.
- An unnamed tributary to Middle Fork Warm Springs Creek flowed directly through the waste rock material at the site. Observed releases to this tributary were documented for arsenic, cadmium, copper, lead, and zinc. The MCL for cadmium was exceeded in the downstream sample; this exceedance was directly attributable to the site. Acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for copper were exceeded in the downstream sample; these exceedances were also directly attributable to the site.
- One potentially hazardous open adit was identified at the site.

**Middle Fork Warm Springs PA# 22-046**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/17/93**

**SOLID MATRIX ANALYSES**

**Metals in soils      Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-046-SE-1	7.43 J	23 J	0.6 U	5.53	3.63	12.6	9220	0.031 U	223	4.51	9.5 U	7.21 U	28.4 J	NR
22-046-SE-2	1130 J	37.9 J	14.7 J	13.4	15.8	115	32500	0.206	814	7.71	263 J	7.59 U	1610 J	NR
22-046-WR-1	5540 J	14.2 J	0.7 J	2.17 U	1.53 U	63.4	24100	0.08	41.4	2.83 U	992 J	6.88 U	188 J	NR
22-046-WR-2	3010 J	12.9 J	0.5 U	3.5	1.38 U	114	30100	0.189	295	2.55 U	2450 J	6.18 U	523 J	NR
22-046-WR-3	4290 J	9.29 J	5.0 J	1.86 U	1.61	93.8	30400	0.273	453	2.43 U	1890 J	5.89 U	1350 J	NR
22-046-WR-4	24000 J	8.4 J	7.3 J	10.9	3.55	252	68600	0.027 U	1200	7.77	2550 J	6.07 U	1100 J	NR
BACKGROUND	32.1 J	77.7 J	0.9 J	14.1	16.8	29.2	27200	0.03 U	587	9.28	52.7 J	5.46 U	116 J	NR

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE POTENT	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
22-046-WR-1	0.25	7.81	-6.12	-13.9	0.24	-13.9	<0.01	0.01	0.01	0.00	0.00	-6.12		
22-046-WR-2	0.74	23.1	-1.81	-24.9	0.66	-24.9	0.02	0.06	0.06	0.62	-2.44			
22-046-WR-3	1.19	37.2	7.71	-29.5	0.56	-29.5	0.25	0.38	0.38	7.81	-0.10			
22-046-WR-4	6.65	208	10.4	-197	1.60	-197	1.59	3.46	3.46	49.7	-39.2			

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**WATER MATRIX ANALYSES**

**Metals in Water      Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-046-SW-1	2.5	6.17	2.57 U	9.7 U	6.83 U	1.77 J	67.5	0.25 J	6.07	12.7 U	0.72 U	30.7 U	13.3	28.1
22-046-SW-2	23.1	8.27	8.27 J	9.7 U	6.83 U	12.8 J	337	0.21 J	317	12.7 U	2.22	30.7 U	1290	101

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-046-SW-1	81	< 5.0	9	< 0.05	NR
22-046-SW-2	176	< 5.0	61	< 0.05	NR

**LEGEND**

SE1 - Upgradient (200') on unnamed tributary of Middle Fork Warm Springs.  
 SE2 - Downgradient (150') on unnamed tributary of Middle Fork Warm Springs.  
 WR1 - Composite of subsamples WR5B and 5C.  
 WR2 - Composite of subsamples WR5A, 6A, and 6B.  
 WR3 - Composite of subsamples WR1, 2, 3A, and 3B.  
 WR4 - Composite of subsample WR4A and 4B.

BACKGROUND - 50 feet South and East of SW-1  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Alhambra Hot Springs</u>	County: <u>Jefferson</u>
Legal Description: <u>T 8 N R 3 W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 16</u>
Mining District: <u>Alhambra</u>	Mine Type: <u>Hardrock/Gravel</u>
Latitude: <u>N 46° 27' 05"</u>	Primary Drainage: <u>Prickly Pear Creek</u>
Longitude: <u>W 111° 59' 02"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Warm Springs Creek</u>
Quad: <u>Clancy</u>	Date Investigated: <u>August 17, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>22-049</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 5,560 cubic yards. The following elements were elevated at least three times background:

Barium: 310J to 529J mg/kg	Mercury: 0.473 to 2.26 mg/kg
Lead: 4,260 mg/kg	Antimony: 17.5J mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Warm Springs Creek was flowing approximately 300 feet south of the site; however, no surface water or sediment samples were collected due to lack of a direct runoff route.
- A potentially hazardous 10 foot highwall was identified above the upper waste rock dump.

Alhambra Hot Springs PA# 22-049  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/17/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-049-WR-1	21.2 J	310 J	1.2 J	1.66 U	1.17 U	171	3650	2.26	53.7	2.17 U	4260 J	17.5 J	148 J	NR
22-049-WR-2	14.3 J	529 J	1.4 J	4.75	1.18 U	10.2	9920	0.473	288	3.43	106 J	5.3 U	66.1 J	NR
BACKGROUND	32.1 J	77.7 J	0.9 J	14.1	16.8	29.2	27200	0.03 U	587	9.28	52.7 J	5.48 U	116 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	1.43	ACID BASE POTENT. 1/1000x	-0.76	SULFUR %	0.02	SULFUR %	0.01	SULFUR %	0.05	SULFUR %	0.00	ACID BASE POTENT. 1/1000x	1.43
22-049-WR-1	0.07	2.19	4.30		2.74		0.03		<0.01							4.30
22-049-WR-2	0.05	1.56							<0.01							

LEGEND

WR1 - Sample of subsample WR1.  
WR2 - Composite of subsamples WR2, 3A, and 3B.  
BACKGROUND - From Middle Fork Warm Springs (22-046-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Solar Silver</u>	County: <u>Jefferson</u>
Legal Description: <u>T 8 N R 2 W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 30</u>
Mining District: <u>Warm Springs</u>	Mine Type: <u>Hardrock/Pb, Ag, Au</u>
Latitude: <u>N 46° 25' 00"</u>	Primary Drainage: <u>Middle Fork Warm Springs Creek</u>
Longitude: <u>W 111° 53' 48"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Unnamed tributary to Middle Fork Warm Springs Creek</u>
Quad: <u>Clancy</u>	Date: <u>August 17, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>22-054</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 1,700 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 2,760J mg/kg      Lead: 715J mg/kg  
Zinc: 667J mg/kg
- One discharging adit was observed at the site during the investigation. The discharge eventually flowed into an unnamed tributary of Middle Fork Warm Springs Creek. MCLs for arsenic and cadmium were exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for copper and zinc, and the chronic aquatic life criteria for iron was exceeded. The pH measurement in the adit discharge was 6.94.
- Middle Fork Warm Springs Creek flowed directly adjacent to the waste rock dump. Observed releases to Middle Fork Warm Springs Creek were documented for arsenic, lead, and zinc. The MCL for cadmium was exceeded in the downstream sample; however, the exceedance was not attributable to the site. Acute and chronic aquatic life criteria for zinc were exceeded in the downstream sample; these exceedances were directly attributable to the site.
- One potentially hazardous open adit was identified at the site.

Solar Silver PA# 22-054  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-046-SE-2	1130 J	37.9 J	15 J	13.4	15.8	115	32500	0.206	814	7.71	263 J	7.59 U	1610 J	NR
22-046-WR-5	2760 J	29.1 J	1 J	6.95	6.07	83	56800	0.037	720	3.4	715 J	6.91 U	667 J	NR
BACKGROUND	32.1 J	77.7 J	1 J	14.1	16.8	29.2	27200	0.03 U	587	9.28	52.7 J	5.46 U	116 J	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		PYRITIC SULFUR ACID BASE POTENT		ORGANIC SULFUR		SULFUR ACID BASE POTENT	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
22-046-WR-5	1.37	42.8	-5.6	-48	125	-0.01	0.16	0	-5.55			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
22-046-SW-1	2.5	6.17	2.57 U	9.7 U	6.83 U	1.77 J	67.5	0.25 J	6.07	12.7 U	0.72 U	30.7 U	13.3
22-046-SW-2	23.1	8.27	8.27 J	9.7 U	6.83 U	12.8 J	337	0.21 J	317	12.7 U	2.22	30.7 U	1290
22-046-SW-7	152	6.4	10.9 J	9.7 U	6.83 U	108 J	4810	0.22 J	1490	12.7 U	5.03	30.7 U	2250

HARDNESS  
CALC.  
Zn(mg CaCO3/L)

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-046-SW-1	81	< 5.0	9	< 0.05	NR
22-046-SW-2	176	< 5.0	61	< 0.05	NR
22-046-SW-7	373	< 5.0	172	< 0.05	NR

LEGEND

SE1 - Upgradient on unnamed tributary (250') of Midd. Fk. Wrm. Sprgs.  
SE2 - Downgradient (150') unnamed tributary from waste rock dump 7.  
WR5 - Composite of subsamples WR7B and 7A.  
BACKGROUND - From the Middle Fork Warm Springs (22-046-SB-1).

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW7 - Add discharge at waste rock dump 7.

NOTE: 22-046-WR-5 was collected and submitted to the lab under 22-046, not as 22-054 (Solar Silver).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bullion</u>	County: <u>Jefferson</u>
Legal Description: <u>T 7N R 6W</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 13</u>
Mining District: <u>Basin</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 21' 22"</u>	Primary Drainage: <u>Basin Creek</u>
Longitude: <u>W 112° 17' 40"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Jack Creek</u>
Quad: <u>Basin</u>	Date Investigated: <u>July 6, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-008</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 4,200 cubic yards of tailings on site. The following elements were elevated at least three times background:  
Arsenic: 2,440 to 4,470 mg/kg      Cadmium: 2.9 mg/kg  
Copper: 172 to 257 mg/kg      Mercury: 0.373J to 0.575J mg/kg  
Lead: 3,330J to 5,110J mg/kg      Antimony: 151 to 196 mg/kg
- There were approximately 42,150 cubic yards of waste rock on site. The following were elevated at least three times background:  
Arsenic: 1,690J to 18,100J mg/kg      Cadmium: 4.1 mg/kg  
Copper: 137 to 372 mg/kg      Mercury: 0.383J to 0.519J mg/kg  
Lead: 3,610J to 11,300J mg/kg      Antimony: 66 to 254 mg/kg  
Zinc: 695 mg/kg
- There were two discharging adits on site. One entered surface water and was sampled as GW-1. This discharge had a flow rate of approximately 7 gpm, the pH was 2.92, and a specific conductance of 2610 umhos/cm. This discharge exceeded MCL/MCLGs for arsenic, cadmium, copper, nickel, and antimony. The chronic and acute aquatic life criteria for arsenic, cadmium, copper, lead, and zinc were exceeded. The chronic aquatic life criteria for iron was also exceeded.
- The tributary of Jack Creek received the adit discharge and flowed through the tailings. Observed releases were documented for arsenic, cadmium, copper, lead, and zinc. Arsenic and cadmium exceeded MCLs in the downstream surface water sample. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, and zinc both upstream and downstream of the site. Observed releases to the stream sediments were also documented for arsenic, copper, lead, antimony, and zinc.
- There were no hazardous openings on site. There were five hazardous structures and three highwalls at pits or trenches.

**Bullion PA# 22-008**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 07/06/93**

**SOLID MATRIX ANALYSES**

**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-008-SE-1	9 J	29.9	0.5 U	3.1	4.1	6.6	7440	0.038 J	163	4	8 J	3 U	34	NR
22-008-SE-2	2180 J	48.1	0.6 U	11.6	5.5	192	39200	0.062 J	853	13	179 J	15	313	NR
22-008-SE-3	1230 J	56.4	0.9	9	7.4	146	18600	0.066 J	396	7	393 J	21	275	NR
22-008-TP-1	2440 J	88.9	2.9	2.2	2.6	257	7280	0.203 J	16.9	4	3330 J	196	558	NR
22-008-TP-2	3420 J	118	0.5 U	1.1 U	2.8	172	11600	0.575 J	18.5	2 U	3870 J	164	104	NR
22-008-TP-3	4470 J	40.6	0.5 U	14	8.2	674	15100	0.373 J	7.9	4	5110 J	151	175	NR
22-008-WR-1	18100 J	138	0.6 U	1.7	2.3	137	36700	0.383 J	84.7	2 U	3610 J	254	135	NR
22-008-WR-2	1690 J	22.5	4.1	2.1	1 U	372	15800	0.519 J	83.7	2 U	11300 J	66	695	NR
BACKGROUND	68 J	344	0.6 U	22.1	20.3	35	35000	0.08 J	6830	21	39 J	5 U	188	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE V/1000R	NEUTRAL POTENT. V/1000R	SULFUR ACID BASE POTENT. V/1000R	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. V/1000R	SULFUR ACID BASE POTENT. V/1000R
22-008-TP-1DUP	0.31	9.68	0.42	-9.3	0.14	0.09	0.08	2.81	-2.39
22-008-TP-1	0.32	10	0.58	-9.4	0.15	0.08	0.09	2.5	-1.92
22-008-TP-2	0.21	6.56	-0.9	-7.5	0.19	0.01	0.01	0.31	-1.23
22-008-TP-3	1.21	37.8	-3.3	-41	<0.01	1.24	0.1	38.7	-42
22-008-WR-1	1.04	32.5	-2.6	-35	0.93	0.02	0.09	0.62	-3.23
22-008-WR-2	1.41	44	-4.4	-48	1.1	<0.01	0.33	0	-4.39

**WATER MATRIX ANALYSES**

**Metals in Water Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-008-GW-1	12700	8.57	738	508	13.3 J	19400 J	325000 J	0.038 U	31000 JX	142	743 JX	147	80800 J	366
22-008-SW-1	2.02	13.6	257 U	9.7 U	15 J	12.2 J	105 J	0.038 U	4.6 JX	12.7 U	4.96 JX	30.7 U	45.2 J	19.7
22-008-SW-2	208	12.5	26.4	20.5	6.83 U	631 J	8470 J	0.038 U	1200 JX	12.8	15.4 JX	30.7 U	2960 J	33.2
22-008-SW-3	92.5	13.6	22.9	17.1	10.9 J	424 J	4280 J	0.038 U	930 JX	12.7 U	15.2 JX	30.7 U	2570 J	35.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-008-GW-1	72	< 5.0	< 5	< 0.05	NR
22-008-SW-1	114	< 5.0	47	< 0.05	NR
22-008-SW-2	137	< 5.0	47	< 0.05	NR
22-008-SW-3					

**LEGEND**

- SE1 - Upgradient on Jack Creek.  
 SE2 - PPE - Adit #6 discharge after flowing through dump.  
 SE3 - Downgradient Jack Creek, approx. 100' below TP2.  
 TP1 - Composite of subsamples TP1A-A, B, C, and TP1B-A, B.  
 TP2 - Composite of subsamples TP2A-A, B, and TP2B-A, B.  
 TP3 - Composite of subsamples TP1A-D, 2A-C, and 2B-C.  
 WR1 - Composite of subsamples WR2B, 2C, and 3B.  
 WR2 - Composite of subsamples WR3A, 3B, and 3D.  
 BACKGROUND - From the Bullion Mine (22-008-SS-1).  
 TP1DUP - Duplicate of sample 22-008-TP-1.  
 GW1 - Adit discharge above mill.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Josephine  
Legal Description: T 8N R 6W  
Mining District: Basin  
Latitude: N 46° 24' 58"  
Longitude: W 112° 18' 36"  
Land Status: Private  
Quad: Three Brothers  
Inspectors: Bisch, Flammang, West  
Organization: Pioneer Technical Services, Inc.

County: Jefferson  
Section(s): SE 1/4, NE 1/4, Section 26  
Mine Type: Hardrock/Au, Ag, Pb  
Primary Drainage: Basin Creek  
USGS Code: 10020006  
Secondary Drainage: Clear Creek  
Date Investigated: August 2, 1994  
P.A. # 22-031

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 21,680 cubic yards. Several of the dumps were situated directly in the Clear Creek floodplain. The following elements were elevated to at least three times the background concentrations:  
Silver: 30.8 to 64.7 mg/kg  
Arsenic: 1,960J mg/kg  
Lead: 3,000 to 10,600 mg/kg
- One discharging adit and two filled shafts were observed at the site. The pH of the adit discharge, which eventually entered Clear Creek, was measured at 4.16. The MCL for cadmium and the EPA action level for lead were exceeded in the adit discharge, as were the acute and chronic aquatic life criteria for silver, cadmium, copper, lead, and zinc and the chronic aquatic life criteria for mercury. One of the filled shafts that was sampled during the investigation had a pH of 5.8. No MCLs were exceeded in water contained in the shaft.
- Observed releases to Clear Creek were documented for silver and lead. No MCLs were exceeded in Clear Creek; however, the acute and chronic aquatic life criteria for silver and lead were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included two fenced but open shafts, a collapsing loadout structure, and several collapsing cabins.

Josephine PA# 22-031  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 08/02/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-031-SE1	3.4	82.2 J	13.3 J	0.9 UJ	1.8 UJ	1.5 UJ	41.9	4470 JX	0.17 JX	20.3 J	3.1 U	465	11.3 UJ	45.9	NR
22-031-SE2	1.1 U	32.2 J	63.3 J	1.0 UJ	2.5 J	1.7 UJ	11.4	3990 JX	0.09 JX	418 J	3.5 U	72.4	12.5 UJ	53.5	NR
22-031-WR1	30.8	225 J	19.7 J	0.7 UJ	1.4 UJ	1.2 UJ	75.4	8960 JX	0.70 JX	66.4 J	2.5 U	3000	8.9 UJ	46.4	NR
22-031-WR2	64.7	1960 J	17.0 J	0.7 UJ	1.4 UJ	1.1 UJ	106	7020 JX	0.50 JX	1.7 J	2.4 U	10600	23.0 J	68.0	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 J	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		SULFUR NEUTRAL		SULFUR POTENT		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT
22-031-WR1	0.10	3.12	-0.70	-3.8	0.10	-0.01	0.01	0.00	-0.70	0.94	-0.70	0.09	0.01	0.00	-0.70	0.09	0.01	-0.70
22-031-WR2	0.38	11.9	-3.30	-15	0.26	0.03	0.09	0.00	-4.24									-4.24

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	Au	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-031-AD1	2.55	15.3	11.4	10.4	8.4 U	6.8 U	295	446	0.10	259	14.4 U	554 J	51.6 U	1430	48.4
22-031-GW1	0.28	7.1	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	898	0.08 U	48.1	14.4 U	22.8 J	51.6 U	15.6 U	2.8
22-031-GW2	0.26	7.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	1050	0.08 U	57.7	14.4 U	23.4 J	51.6 U	27.2	3.0
22-031-SW1	0.72	7.8	5.5 U	4.0 U	8.4 U	6.8 U	13.7	241	0.13	20.8	14.4 U	39.8 J	51.6 U	84.1	8.7
22-031-SW2	0.21	3.5	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	32.1	0.11	2.3 U	14.4 U	2.0 J	51.6 U	15.6 U	4.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-031-AD1	68	<5.0	66	<0.05	NR
22-031-GW1	13	<5.0	10	<0.05	NR
22-031-GW2	<4.0	<5.0	10	<0.05	NR
22-031-SW1	40	<5.0	10	0.23	NR
22-031-SW2	<4.0	<5.0	<5.0	0.09	NR

LEGEND

- SE1 - 15% demineralized from WR1 in Clear Creek.  
SE2 - Dry residue sample collected upstream from WR1 and WR2.  
WR1 - Composite of subsamples WR1A, 1B, 2A, 3A, 4B, 5A, 5B, and 7.  
WR2 - Composite of subsamples WR2A through 6C.  
BACKGROUND - From the Josephine Mine (22-031-SB1).
- AD1 - Approx. 3' from where water emerges from collapsed adit on WR1.  
GW1 - Standing water in shaft 63.  
GW2 - Duplicate of GW1.  
SW1 - Same as sample 22-031-SB1.  
SW2 - Sample from Clear Creek between WR1 and WR2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Basin Millsite</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6 N R 5 W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 17</u>
Mining District: <u>Basin</u>	Mine Type: <u>Millsite/Custom mill</u>
Latitude: <u>N 46° 16' 17"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 15' 18"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Basin</u>	Date Investigated: <u>July 9, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>22-036</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins</u>	

- The volume of tailings associated with this site was estimated to be approximately 19,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2,840JX mg/kg	Barium: 350 mg/kg
Cadmium: 27.7 mg/kg	Copper: 252 mg/kg
Mercury: 0.585J mg/kg	Manganese: 1,360J to 5,050J mg/kg
Lead: 102 to 3,340 mg/kg	Antimony: 37J mg/kg
Zinc: 4,460 mg/kg	
  
- The volume of waste rock associated with this site was estimated to be approximately 1,735 cubic yards. The following elements were elevated at least three times background:

Arsenic: 139JX to 232JX mg/kg	Cadmium: 38.5 to 103 mg/kg
Copper: 342 to 963 mg/kg	Mercury: 0.493J to 0.517J mg/kg
Manganese: 1,370J mg/kg	Lead: 2,190 to 11,900 mg/kg
Antimony: 35J to 329J mg/kg	Zinc: 3,770 to 12,500 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
  
- No surface water was flowing on or near the site during the investigation. The nearest surface water was over 1,000 feet away; no surface water samples were collected due to the lack of a direct runoff route.
  
- No hazardous mine openings were identified at the site.

Basin Millsite PA# 22-036  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-036-TP-1	39 JX	43.5	0.5 U	3.6	11.9	25.5	10700	0.014 J	1360 J	4	102	6 UJ	135	0.308 U
22-036-TP-2	2840 JX	350	27.7	9.3	10.8	252	26900	0.585 J	5050 J	11	3340	37 J	4460	0.302 U
22-036-WR-1	232 JX	64.1	38.5	4.9	1.7	963	18900	0.493 J	672 J	6	11900	329 J	3770	NR
22-036-WR-2	139 JX	59.1	103	4.4	7.4	342	17300	0.517 J	1370 J	4	2190	35 J	12500	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
22-036-TP-1	<0.01	0	94.4	94.4	<0.01	<0.01	0.04	0	94.4
22-036-TP-2	1.69	52.8	114	61.2	0.34	1.12	0.23	35	79
22-036-WR-1	2.91	90.9	3.63	-87	<0.01	2.16	0.84	67.5	-63.8
22-036-WR-2	2.19	68.4	9.8	-59	0.85	0.63	0.71	19.7	-9.88

LEGEND

TP1 - Composite of subsamples TP1A-A, -B, 1B-A, and -B.  
TP2 - Composite of subsamples TP1A-C, 1C-A, 1C-B, and 1C-C.  
WR1 - Composite of subsamples WR1, 2, 3, 4, 5, 6, and 7.  
WR2 - Same as sample 22-036-WR-1. (Split)  
BACKGROUND - From Morning Glory Mine (22-077-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Perry Park</u>	County: <u>Jefferson</u>
Legal Description: <u>T 8 N R 6 W</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 36</u>
Mining District: <u>Basin</u>	Mine Type: <u>Placer/Au</u>
Latitude: <u>N 46° 24' 03"</u>	Primary Drainage: <u>Basin Creek</u>
Longitude: <u>W 112° 18' 02"</u>	USGS Code: <u>1002006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Grub Gulch</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 9, 1993</u>
Inspectors: <u>Babits, Bullock, Clark</u>	P.A. # <u>22-039</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- No waste rock was observed at this site during the investigation.
- Approximately 22,000 cubic yards of placer dredgings were identified at the site. The material consisted of very large cobbles and boulders; consequently, no samples were collected.
- The dredged material was situated directly in Grub Gulch. A sediment sample did not indicate any metals values elevated above background. No surface water samples were collected.
- No hazardous mine openings or structures were identified at the site.

Perry's Park PA# 22-039  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BABITS  
 INVESTIGATION DATE: 07/09/83

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-039-SE-1	15 J	27.1	0.5 U	4.7	3.6	6.8	10000	0.028 J	428	4	8 J	4 U	66	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy of Precision; NR - Not Requested

LEGEND

SE1 - Grub Gulch below placer diggings approx. 300' above crossing  
 BACKGROUND - From the Enterprise (22-074-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Buckeye</u> Legal Description: <u>T 8 N R 6 W</u> Mining District: <u>Basin</u> Latitude: <u>N 46° 23' 52"</u> Longitude: <u>W 112° 17' 38"</u> Land Status: <u>Private/Public</u> Quad: <u>Three Brothers</u> Inspectors: <u>Babits, Lasher/Pierson</u> Organization: <u>Pioneer Technical Services, Inc/ Thomas Dean &amp; Hoskins, Inc.</u>	County: <u>Jefferson</u> Section(s): <u>NW 1/4, SE 1/4, Sec. 36</u> Mine Type: <u>Hardrock/Au</u> Primary Drainage: <u>Basin Creek</u> USGS Code: <u>10020006</u> Secondary Drainage: <u>Basin Creek</u> Date Investigated: <u>July 6, 1993</u> P.A. # <u>22-072</u>
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- The volume of tailings associated with this site was estimated to be approximately 20,750 cubic yards. The following elements were elevated at least three times background:

Arsenic: 708JX to 17,100JX mg/kg	Cadmium: 3.9 to 24.9 mg/kg
Copper: 168 to 1,160 mg/kg	Lead: 417 to 14,100 mg/kg
Antimony: 76J to 2,350J mg/kg	Zinc: 1,250 to 4,040 mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 6,130 cubic yards. The following elements were elevated at least three times background:

Arsenic: 628JX mg/kg	Mercury: 0.342J mg/kg
Manganese: 1,970 mg/kg	Lead: 1,850 mg/kg
Antimony: 29J mg/kg	Zinc: 340 mg/kg
  
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
  
- Basin Creek flowed directly adjacent to the tailings. Surface water and sediment samples were collected upstream and downstream from the site. No MCLs were exceeded in the Basin Creek samples. Acute and chronic aquatic life criteria were exceeded for copper and zinc in the downstream sample; these exceedances were directly attributable to the site.
  
- No hazardous mine openings or structures were identified at the site.

**Buckeye PA# 22-072**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/06/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-074-SE-2	2360	30	1.2	10.5	12.6 J	60.6 J	47100	0.083 J	455 J	9	415 JX	42 J	208 JX	NR
22-072-SE-3	997 JX	30.4	0.9	7.2	4.8	44.3	19200	0.056 J	488 J	6	589	74 J	253	NR
22-072-TP-1	17100 JX	29.6	24.9	4	1.4	1160	24400	0.108 J	24.2 J	2 U	14100	2350 J	4040	0.271 U
22-072-TP-2	252 JX	224	3.9	16.2	17	168	16900	0.082 J	237 J	22	281	12 UJ	1250	0.577 U
22-072-TP-3	708 JX	74.4	0.9 U	5.2	7	51.2	6610	0.057 J	61.7 J	5 U	213	19 J	300	0.41 U
22-072-TP-4	7160 JX	66.4	0.4 U	5.6	3.8	17.9	21000	0.03 J	393 J	4	417	78 J	54	0.268 U
22-072-WR-1	628 JX	31	0.5 U	4.1	1.4 U	35	16800	0.342 J	1970 J	5	1850	29 J	340	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE V/1000	ACID BASE V/1000	POTENT. V/1000	NEUTRAL V/1000	POTENT. V/1000	ACID BASE V/1000	POTENT. V/1000	SULFUR %	SULFATE %	PYRITIC %	SULFUR %	ORGANIC %	SULFUR %	ACID BASE V/1000	POTENT. V/1000	ACID BASE V/1000	POTENT. V/1000
22-072-TP-1	2.45	76.5	-2	-79	0.84	1.54	0.27	48.1	-50.1									
22-072-TP-2	0.31	9.68	-0.9	-11	0.11	0.06	0.14	1.87	-2.79									
22-072-TP-3DUP	0.09	2.81	1.03	-1.8	0.05	0.02	0.02	0.62	0.4									
22-072-TP-3	0.09	2.81	0.82	-2	0.05	0.02	0.02	0.62	0.19									
22-072-TP-4	0.04	1.25	-0.8	-2.1	0.04	-0.01	<0.01	0	-0.81									
22-072-WR-1	0.87	27.2	8.72	-19	0.58	0.13	0.16	4.06	4.66									
22-072-WR-1DUP	0.88	27.5	9.25	-18	0.59	0.13	0.16	4.06	5.19									

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-074-SW-2	10.1 J	4.43	2.57 U	9.7 U	6.83 U	6.23 J	167	0.038 U	143	12.7 U	9.67 J	30.7 U	129	23.3
22-072-SW-3	18.1	5.53	2.57 U	9.7 U	9.27 J	15.9 J	284 J	0.038 U	161 JX	12.7 U	14.5 JX	30.7 U	165 J	25.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-074-SW-2	80	< 5.0	8	< 0.05	NR
22-072-SW-3	89	< 5.0	8	< 0.05	NR

**LEGEND**

- 22-074-SE2 - In Basin Creek down on PPE from Enterprise Mine.
- SE3 - Downgradient of PPE of tailings in Basin Creek.
- TP1 - Composite of subsamples TP1A-A, 1A-B, and 1B-A.
- TP2 - Composite of subsamples TP1B-B, 1B-C, 1C-B, and 1D-B.
- TP3 - Composite of subsamples TP1C-A and 1D-A.
- TP4 - Sample of TPE subsample.
- BACKGROUND - From the Enterprise Mine (22-074-SS-1).
- SW3 - Same as sample SE3.
- 22-074-SW2 - Same as 22-074-SE2 sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Enterprise</u>	County: <u>Jefferson</u>
Legal Description: <u>T 8 N R 6 W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 36</u>
Mining District: <u>Basin</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 23' 52"</u>	Primary Drainage: <u>Basin Creek</u>
Longitude: <u>W 112° 17' 38"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 6, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>22-074</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 22,930 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 5,840 to 22,400 mg/kg    Lead: 1,000JX to 3,520JX mg/kg  
Antimony: 91J to 291J mg/kg
- One discharging adit was identified at the site. MCLs were exceeded for arsenic, copper, cadmium, and antimony in the adit discharge. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc, and chronic aquatic life criteria were exceeded for iron and mercury. The pH measurement in the adit discharge was 2.9.
- The adit discharge entered Basin Creek downstream from the site. Surface water and sediment samples were collected from Basin Creek upstream and downstream from the adit discharge confluence. Acute and chronic aquatic life criteria were exceeded for copper and zinc in the downstream sample; these exceedances were directly attributable to the adit discharge.
- Observed releases to Basin Creek (sediment) were documented for arsenic, lead, and antimony, which were directly attributable to the site.
- No hazardous mine openings were identified at the site.

Enterprise PA# 22-074  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-074-SE-1	15	29.2	0.6 U	8.1	5.7 J	12.9 J	15400	0.031 J	412 J	6	34 JX	7 UJ	95 JX	NR
22-074-SE-2	2360	30	1.2	10.5	12.6 J	60.6 J	47100	0.083 J	455 J	9	415 JX	42 J	208 JX	NR
22-074-WR-1	5840	81.5	0.9	2.2 U	2.3 J	62.4 J	37000	0.088 J	131 J	3 U	1000 JX	91 J	133 JX	NR
22-074-WR-2	22400	24.4	1.4	2.1 U	1.4 UJ	94.6 J	33100	0.209 J	20.8 J	3 U	3520 JX	291 J	78 JX	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
22-074-WR-1	0.38	11.9	-3.1	-15	0.03	<0.01	0	-3.1
22-074-WR-2	2.97	92.8	-4.8	-98	0.58	1.76	55	-59.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-074-SW-1	3.71 J	4.27	2.57 U	9.7 U	6.83 U	2.43 J	99.7	0.130 J	13.3	12.7 U	5.42 J	30.7 U	12.9	23
22-074-SW-2	10.1 J	4.43	2.57 U	9.7 U	6.83 U	6.23 J	167	0.038 U	143	12.7 U	9.67 J	30.7 U	129	23.3
22-074-SW-4	15500 J	13.9	146	42	6.83 U	1340 J	131000	0.081 J	28900	31.7	1340 J	84.2	23400	192

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-074-SW-1	43	< 5.0	< 5	< 0.05	NR
22-074-SW-2	80	< 5.0	8	< 0.05	NR
22-074-SW-4	1050	< 5.0	622	< 0.05	NR

LEGEND

SE1 - Upgradient in Basin 100' above confluence with unnamed tributary.  
SE2 - In Basin Creek down of PPE of edit discharge.  
WR1 - Composite of subsamples WR2A and 2D.  
WR2 - Composite of subsamples WR2B and 2C.  
BACKGROUND - 300' upgradient from SW1. From Enterprise (22-074-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW4 - Addit discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Doris</u>	County: <u>Jefferson</u>
Legal Description: T <u>6N</u> R <u>5W</u>	Section(s): <u>SW 1/4, SE 1/4, Section 7</u>
Mining District: <u>Basin</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 66' 58"</u>	Primary Drainage: <u>Basin Creek</u>
Longitude: <u>W 112° 16' 30"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Basin</u>	Date Investigated: <u>June 17, 1994</u>
Inspectors: <u>Bullock, Bisch, Clark, West</u>	P.A. # <u>22-293</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 4,470 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 17 mg/kg	Mercury: 3.33J mg/kg
Cadmium: 11.9JX mg/kg	Manganese: 2410JX mg/kg
Cobalt: 10.4 mg/kg	Lead: 182JX to 2,000JX mg/kg
Copper: 531J mg/kg	Zinc: 722 to 1,570 mg/kg
- Waste rock was actively eroding into Basin Creek at the site. An observed release to Basin Creek (sediment) was documented for copper.
- No MCLs were exceeded in Basin Creek; however, acute and chronic aquatic life criteria for copper and zinc were exceeded in both the upstream and downstream samples. Additionally, the chronic aquatic life criteria for lead and mercury were exceeded in both the upstream and downstream samples.
- Potential safety hazards observed at the site included two partially backfilled adits and a collapsing loadout structure (low hazard potential).

Doris PA# 22-293  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/17/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-293-SE1	0.7	45.9 JX	37.2	2.5 JX	6.5	3.5 J	161 J	9170 J	0.07 J	608 JX	3.9	89.3 JX	6.6 UJ	284	NR
22-293-SE2	0.6 U	74.5 JX	48.7	3.3 JX	7.5	0.9 UJ	27.3 J	5410 J	0.06 J	937 JX	2.5	67.1 JX	5.9 UJ	292	NR
22-293-WR1	17	44.4 JX	9.68	11.9 JX	4.7	3.2 J	531 J	18800 J	3.33 J	527 JX	5.5	2000 JX	5.8 J	1570	NR
22-293-WR2	0.6 U	5.7 UJX	7.84	2.4 JX	10.4	4.9 J	82.2 J	22100 J	0.07 J	2410 JX	8.4	182 JX	6.3 UJ	722	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	10000	%	10000	POTENT.	10000	POTENT.	10000	%	10000	%	10000	%	10000	%	10000	POTENT.	10000
22-293-WR1	0.93	29.1	2.93	13.6	-26	5.20	0.61	0.05	0.07	0.05	0.05	0.05	0.27	2.19	1.56	1.36	1.36	11.4
22-293-WR2	0.27	8.43	13.6	5.20	<0.01								2.19	2.19	2.19	11.4	11.4	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-293-SW1	0.13 JX	13.0	19.4	2.6 U	8.7 U	4.7 U	11.2	390	0.14	29.8	8.0 U	2.9	29.4 U	91.1	24.1
22-293-SW2	0.22 JX	13.7	18.9	2.6 U	8.7 U	4.7 U	11.8	404	0.12	32.7	8.0 U	3.0	29.4 U	98.7	23.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-293-SW1	53	<5	9.0	0.06	NR
22-293-SW2	64	<5	7.0	0.06	NR

LEGEND

SE1 - Determination in Basin Creek.  
SE2 - Upstream in Basin Creek.  
WR1 - Composite of subsamples WR1A through 1C.  
WR2 - Grab sample of the WR2 subsample.  
BACKGROUND - From the Josephine Mine (22-431-SE1).

SW1 - Same as sample 22-293-SE1.  
SW2 - Same as sample 22-293-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Jack Creek Tailings</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>6W</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 14</u>
Mining District: <u>Basin</u>	Mine Type: <u>Tailings</u>
Latitude: <u>N 46° 21' 42"</u>	Primary Drainage: <u>Basin Creek</u>
Longitude: <u>W 112° 18' 27"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Jack Creek</u>
Quad: <u>Basin</u>	Date Investigated: <u>July 6, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-296</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 23,000 cubic yards of tailings on site. The following elements were elevated at least three times background:

Arsenic: 1,890 mg/kg	Cadmium: 2.2 to 4.0 mg/kg
Copper: 381J mg/kg	Lead: 147 to 681JX mg/kg
Antimony: 26J mg/kg	
- There was no waste rock on site.
- There were no discharging mine openings, seeps, or springs identified at this site.
- Jack Creek ran through the tailings impoundment area. No observed releases to Jack Creek were documented; and no MCL/MCLGs were exceeded in upstream or downstream surface water samples. The acute aquatic life criteria was exceeded for lead in the downstream sample, which was directly attributable to the site.
- There were no hazardous openings on site.

Jack Creek Tailings PA# 22-296  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-296-SE-1	573	31.5	4.2	12.9	16.1	127 J	26700	0.013 UJ	579	7 J	158	6 U	284 J	NR
22-296-SE-2	263	24.2	1.7	7.6	3.1 J	83.1 J	8890	0.015 J	440 J	3 U	79 JX	8 UJ	201	NR
22-296-TP-1	132	141	4.0	14.7	15.6	91.1 J	26900	0.044	402	21 J	147	6 U	348 J	NR
22-296-TP-2	1890	67.2	2.2	8.4	7.5 J	381 J	21500	0.096 J	215 J	6	681 JX	26 J	323	NR
BACKGROUND	68 J	344	0.6 U	22.1	20.3	35	35000	0.08 J	6830	21	39 J	5 U	188	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT. 1/1000
22-296-SE-1	0.03	0.94	4.05	4.05	3.12	3.12	0.02	0.02	<0.01	<0.01	0.01	0.01	0	0	4.05	4.05		
22-296-SE-2	0.01	0.31	3.1	3.1	2.79	2.79	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0	0	3.1	3.1		
22-296-TP-1	0.08	2.5	4.76	4.76	2.26	2.26	0.01	0.01	0.03	0.03	0.04	0.04	0.94	0.94	3.82	3.82		
22-296-TP-2	0.08	2.5	1.63	1.63	-0.9	-0.9	0.05	0.05	0.01	0.01	0.02	0.02	0.31	0.31	1.32	1.32		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-296-SW-1	20.8 J	13.1	3.83	9.7 U	6.83 U	63.6 J	723	0.038 U	145	12.7 U	8.96 J	30.7 U	416	25.6
22-296-SW-2	36.5 J	17.7	2.57 U	9.7 U	6.83 U	65.2 J	1170	0.038 U	156	20.4	14.7 J	30.7 U	411	25.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-296-SW-1	58	< 5.0	10	< 0.05	NR
22-296-SW-2	54	< 5.0	14	< 0.05	NR

LEGEND

- SE1 - Upgradient of tailings on Jack Creek.  
SE2 - Downgradient of tailings on Jack Creek.  
TP1 - Composite of subsamples TP1A-A, B, C, and TP1B-A, B, C.  
TP2 - Composite of subsamples TP2C-A, B, and TP2D-A.  
BACKGROUND - From the Bullion Mine (22-008-S5-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Lady Leith  
Legal Description: T 7N R 5W  
Mining District: Basin  
Latitude: N 46° 23' 28"  
Longitude: W 112° 16' 48"  
Land Status: Private/Public  
Quad: Three Brothers  
Inspectors: Bisch, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Jefferson  
Section(s): NE 1/4, NW 1/4, Section 6  
Mine Type: Hardrock/Pb, Zn  
Primary Drainage: Basin Creek  
USGS Code: 10020006  
Secondary Drainage: Basin Creek  
Date Investigated: June 15, 1994  
P.A. # 22-316

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 3,505 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 3.6 to 22.2 mg/kg	Mercury: 0.12J to 0.13J mg/kg
Arsenic: 79.2JX to 3,740JX mg/kg	Manganese: 4,720JX to 5,820 mg/kg
Cadmium: 8.0JX to 32.2JX mg/kg	Lead: 355JX to 4,950JX mg/kg
Copper: 246J mg/kg	Antimony: 78.8J mg/kg
Zinc: 620 to 1,100 mg/kg	
- Two discharging adits were observed at the site. The MCL and acute and chronic aquatic life criteria for cadmium were exceeded in the discharge from Adit #1; and the MCL for arsenic was exceeded in the discharge from Adit #2. Additionally, acute and chronic aquatic life criteria for copper, lead, and zinc were exceeded in the Adit #1 discharge; and acute and chronic aquatic life criteria for zinc were exceeded in the Adit #2 discharge.
- An unnamed tributary to Basin Creek flows through the site. Observed releases to the stream were documented for manganese (surface water) and arsenic, cadmium, lead, and zinc (sediment).
- No MCLs were exceeded in the tributary; however, the chronic aquatic life criteria for lead was exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included a fenced, but open shaft and multiple collapsing cabins (low hazard potential).

Lady Leith PA# 22-316  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 06/15/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-316-SE1	0.6 U	41.4 JX	21.0	1.4 JX	4.8	7.1 J	15.3 J	11100 J	0.04 J	248 JX	3.3	77.1 JX	6.1 JX	65.7	NR
22-316-SE2	0.6 U	211 JX	67.7	4.5 JX	15.4	8.9 J	31.7 J	21700 J	0.07 J	1190 JX	6.8	203 JX	6.6 JX	357	NR
22-316-WR1	15.7	3080 JX	26.0	4.8 JX	10.7	5.3 J	58.7 J	35000 J	0.05 J	1360 JX	3.0	2730 JX	5.8 JX	620	NR
22-316-WR3	3.6	79.2 JX	16.0	8.0 JX	10.9	4.4 J	67.5 J	30100 J	0.12 J	5820 JX	6.3	355 JX	4.8 JX	981	NR
22-316-WR6	22.2	3740 JX	10.7	32.2 JX	12.7	1.7 J	246 J	40400 J	0.13 J	4720 JX	1.4 U	4950 JX	78.8 J	1100	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 JX	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE V/1000	NEUTRAL POTENT V/1000	SULFUR ACID BASE POTENT V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE V/1000	SULFUR ACID BASE POTENT V/1000
22-316-WR1	0.75	23.4	-3.18	-27	0.55	<0.01	0.20	0.00	-3.18
22-316-WR3	0.77	24.1	91.2	67.1	0.13	0.38	0.28	11.9	79.3
22-316-WR6	0.36	11.1	-1.85	-13.0	0.33	<0.01	0.03	0.00	-1.85

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-316-AD1	0.69 JX	15.9	5.1	10.6	21.7	4.7 U	18.4	1670	0.11	536	15.1	84.3	29.4 U	1180	55.5
22-316-AD2	0.12 UX	68.1	10.4	2.6 U	8.7 U	4.7 U	4.6 U	2430	0.11 U	1730	8.0 U	2.8	29.4 U	695	122
22-316-SW1	0.12 UX	3.4	2.8	2.6 U	8.7 U	4.7 U	4.6 U	35.0	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	13.5	18.9
22-316-SW2	0.12 UX	5.9	3.5	2.6 U	8.7 U	4.7 U	4.6 U	95.2	0.11 U	27.5	8.0 U	2.1	29.4 U	21.1	18.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-316-AD1	120	<5	81	<0.05	NR
22-316-AD2	131	<5	70	<0.05	NR
22-316-SW1	10	<5	<5	<0.05	NR
22-316-SW2	9.0	<5	5.0	<0.05	NR

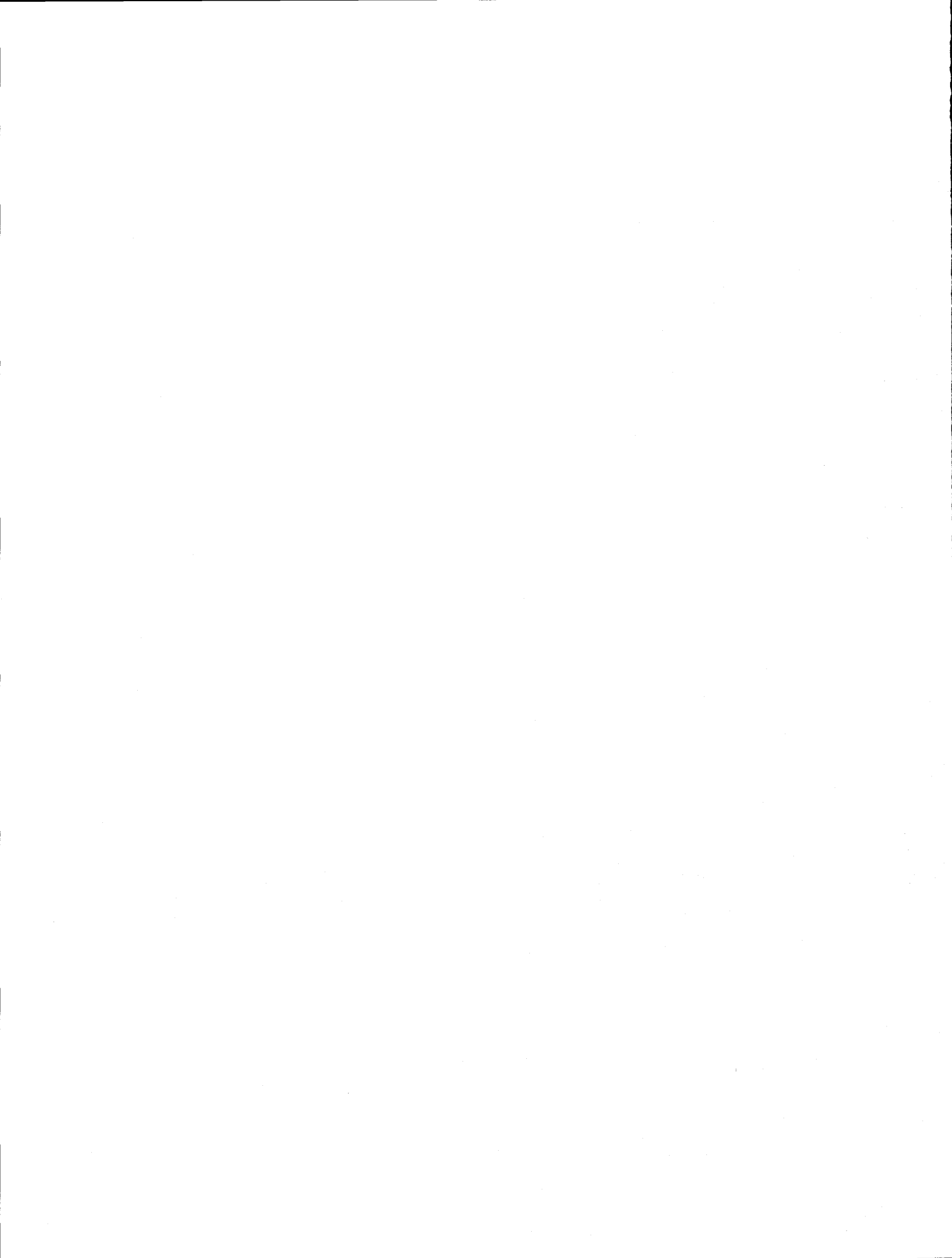
LEGEND

- SE1 - Upstream above site.
- SE2 - Downstream below outlet.
- WR1 - Grab sample of the WR1 sub-sample.
- WR3 - Grab sample of the WR3 sub-sample.
- WR6 - Composite of sub-samples WR4, 5, and 6.
- BACKGROUND - From the Boulder Creek Mine (22-112-681).
- AD1 - Upstream site with mine discharge associated with WR1.
- AD2 - A site located above outlet; associated with WR1.
- SW1 - Same as sample 22-316-SE1.
- SW2 - Same as sample 22-316-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Old Basin Millsite</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 5W</u>	Section(s): <u>SW 1/4, Section 17; SE 1/4, Section 18</u>
Mining District: <u>Basin</u>	Mine Type: <u>Millsite/Au, Zn, Cu, Ag, Pb</u>
Latitude: <u>N 46° 16' 10"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 16' 46"</u>	USGS Code: <u>10020006</u>
Land Status: _____	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Basin</u>	Date Investigated: <u>N/A</u>
Inspectors: <u>N/A</u>	P.A. # <u>22-500</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- A site visit was not conducted at the site during the 1994 inventory. The EPA investigated the site in 1990, and the northwestern part of the site was investigated by MDL in 1993 (Basin Millsite Inventory, 22-036).
- According to the EPA, the total surface area covered by tailings at this site was estimated to be 280,000 square feet. However, the EPA's identification of "tailings" includes waste rock. Using this area, the volume of tailings was estimated to range from 10,000 to 30,000 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Arsenic: 72 to 1,640 mg/kg  
Lead: 274 to 2,710 mg/kg
- No discharging adits, filled shafts, seeps, or springs were associated with the site.
- The Boulder River flows adjacent to the site on the south side. Observed releases to the Boulder River were documented for arsenic (surface water) and lead (sediment). No MCLs were exceeded. The water metals data were not comparable to aquatic life standards due to the lack of associated water hardness data.
- Potential safety hazards associated with the site include a collapsing brick smelter stack and flue and a collapsing loadout structure. Potentially hazardous mine openings were not evaluated by the EPA.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Mantle East</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6 N R 5 W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 9</u>
Mining District: <u>Cataract</u>	Mine Type: <u>Hardrock-Underground/Au</u>
Latitude: <u>N 46° 17' 26"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 14' 21"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 7, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>22-032</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 4,148 cubic yards. The following elements were elevated at least three times background:

Arsenic: 76JX mg/kg	Copper: 38.4 to 66.6 mg/kg
Mercury: 0.208J to 0.254J mg/kg	Manganese: 1,110J mg/kg
Lead: 114 to 288 mg/kg	
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
- WR-5 was situated directly in the Cataract Creek drainage. Sediment samples were collected from Cataract Creek upstream and downstream from the site; no observed releases were documented.
- No hazardous openings or structures were identified at the site.

Mantle (East) PA# 22-032  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/07/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-032-SE-1	271 JX	79.2	9.5	17.1	6.9	360	17600	0.048 J	1070 J	6	232	12 J	889	NR
22-032-SE-2	144	45.8	7.4	16.7	3.8 J	254 J	8780	0.016 J	988 J	4	134 JX	9 J	580 JX	NR
22-032-WR-1	20 JX	38.5	0.6 U	8.6	1.7	38.4	11000	0.208 J	1110 J	7	114	7 UJ	136	NR
22-032-WR-2	76 JX	52.3	0.6 U	8.4	2.6	66.6	18000	0.254 J	1020 J	5	288	7 UJ	278	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

LEGEND

SE1 - Upgradient on Cataract Creek  
SE2 - Downgradient on Cataract Creek  
WR1 - Composite of subsamples WR1, 2, 3, and 4.  
WR2 - Composite of WR5A and 5B.  
BACKGROUND - From the Morning Glory (22-077-SS-1).

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
22-032-WR-1	0.19	5.94	6.71	0.77	0.08	0.03	0.08	0.94	5.77
22-032-WR-2	0.36	11.2	8.54	-2.7	0.2	0.03	0.13	0.94	7.61

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Crystal</u>	County: <u>Jefferson</u>
Legal Description: <u>T 7N R 5W</u>	Section(s): <u>NW 1/4, All 1/4, Sec. 20</u>
Mining District: <u>Basin/Cataract</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 21' 01"</u>	Primary Drainage: <u>Cataract Creek</u>
Longitude: <u>W 112° 15' 37"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Uncle Sam Gulch</u>
Quad: <u>Basin</u>	Date Investigated: <u>July 7, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>22-073</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- Approximately 15 acres of disturbed (strip mined) area was identified at the site. The following elements were elevated at least three times background:

Arsenic: 458J to 7,310 mg/kg	Cadmium: 2.1 to 18.4 mg/kg
Copper: 292 to 1,250 mg/kg	Iron: 65,100 mg/kg
Mercury: 0.492J mg/kg	Lead: 188J to 3,570 mg/kg
Antimony: 23 to 73 mg/kg	Zinc: 479 to 3,260 mg/kg
- One discharging adit was identified at the site. The pH measurement in the adit discharge was 3.41. MCLs for arsenic, cadmium, and copper were exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc.
- Waste rock was observed directly in the Uncle Sam Gulch drainage. Observed releases to Uncle Sam Gulch were documented for arsenic, cadmium, copper, iron, lead, and zinc. MCLs were exceeded for arsenic, cadmium, and copper in the downstream sample; these exceedances were directly attributable to the site. Acute and chronic aquatic life criteria were exceeded for arsenic and cadmium in the downstream sample, again attributable to the site.
- The U.S. Department of Energy was conducting a research project at this site at the time of the investigation. Settling ponds were being constructed for the treatment of Acid Mine Drainage.
- Two potentially hazardous open adits and a hazardous loadout structure were identified at the site.

**Crystal PA# 22-073**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/07/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-073-SE-1	434 J	19.3	8.1	1.8	1.4	27.4	4820	0.048 J	224	3	513 J	10	1110	NR
22-073-SE-2	1900 J	49.4	1	7.7	2.1	203	17600	0.057 J	758	4	999 J	57	487	NR
22-073-WR-1	2510 J	94	18.4	16.5	6.3	292	38100	0.059 J	1310	13	862 J	23	3260	NR
22-073-WR-2	524 J	39.6	0.6 U	17.8	5.2	337	38000	0.062 J	2840	10	559 J	7	479	NR
22-073-WR-3	449 J	59	17.8	8.4	1.7	376	13900	0.031 J	743	7	3570 J	32	2230	NR
22-073-WR-4	3880 J	341	2.1	7.6	3.4	410	23600	0.062 J	1350	6	3350 J	65	783	NR
22-073-WR-5	7310 J	11.4	0.5 U	1.3	1 U	1250	65100	0.492 J	19.7	2	3090 J	73	290	NR
22-073-WR-6	458 J	45	2	5.4	2.4	88.5	10200	0.051 J	263	3	188 J	6	482	NR
22-073-WR-7	390 J	23.5	0.4 U	1.8	2	39.7	5580	0.107 J	140	3	339 J	9	103	NR
22-073-SE-3	539	57	13.6	20.2	2.6 J	848 J	11600	0.033 J	1020 J	5	387 JX	15 J	937 JX	NR
BACKGROUND	140 J	193	0.7 U	9.4	14.9	71.2	21200	0.114 J	1830	11	56 J	5 U	159	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT. 1/1000
22-073-WR-1	0.61	19.1	2.13	-17	0.29	0.16	0.16	5	-2.87							
22-073-WR-2	0.01	0.31	4.83	4.52	0.01	-0.01	-0.01	0	4.83							
22-073-WR-3	0.63	19.7	7.36	-12	-0.01	0.37	0.39	11.6	-4.2							
22-073-WR-4	0.25	7.81	5.47	-2.3	0.24	-0.01	0.01	0	5.47							
22-073-WR-5	3.75	117	-9.8	-127	0.35	2.47	0.93	77.2	-87							
22-073-WR-6	0.01	0.31	6.65	6.34	-0.01	0.01	-0.01	0.31	6.34							
22-073-WR-7	0.08	2.5	-0.9	-3.4	-0.01	0.02	0.1	0.62	-1.51							

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)	HARDNESS CALC.
22-073-SW-1	5.59	6.4	2.57 U	9.7 U	6.83 U	10.8 J	228 J	0.038 U	15.8 JX	12.7 U	5.14 JX	30.7 U	38.4 J	9.5
22-073-SW-2	724	10.4	131	52.7	8.4 J	3130 J	9340 J	0.038 U	2100 JX	12.7 U	46.8 JX	30.7 U	11500 J	46.6
22-073-SW-4	9910	29.8	1010	363	12.5 J	28700 J	112000 J	0.038 U	13600 JX	59.1	425 JX	172	84300 J	224

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-073-SW-1	48	< 5.0	< 10	< 0.05	NR
22-073-SW-2	191	< 5.0	97	< 0.05	NR
22-073-SW-4	1230	< 5.0	710	< 0.05	NR

SE1 - Approx. 300' upgradient on Uncle Sam Gulch

SE2 - Downgradient of edit discharge PPE in Uncle Sam Gulch.

22-073-SE3 - Uncle Sam Gulch, prior to discharge.

WR1 - Composite of subsamples WR1A and 1B.

WR2 - Composite of subsamples WR2A, 2B, 2C, and 2D.

WR3 - Composite of subsamples WR3A, 3B, 3C, 3E, and 3F.

WR5 - Sample of subsample WR4A.

**LEGEND**

WR6 - Composite of subsamples WR6A, 6C, 6D, and 6E.

WR7 - Composite of subsamples WR7A and 4G.

BACKGROUND - From Crystal Mine.

(22-073-SS-1).

SW1 - Same as SE1.

SW2 - Same as SE2.

SW4 - Add discharge.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Eva May</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>5W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 22</u>
Mining District: <u>Cataract</u>	Mine Type: <u>Hardrock/Pb, Cu, Au, Ag</u>
Latitude: <u>N 46° 21' 00"</u>	Primary Drainage: <u>Cataract Creek</u>
Longitude: <u>W 112° 13' 20"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 7, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-075</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 11,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1300 mg/kg	Cadmium: 2.8 mg/kg
Lead: 1450JX mg/kg	Antimony: 70 mg/kg
- The tailings may erode into Cataract Creek during storm events.
- The volume of waste rock associated with this site was estimated to be approximately 92,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 14,700 mg/kg	Cadmium: 11.2 mg/kg
Copper: 357J mg/kg	Mercury: 0.199J to 0.585J mg/kg
Lead: 1270JX to 5970JX mg/kg	Antimony: 114J to 165J mg/kg
Zinc: 1660JX mg/kg	
- The adit discharge at Adit #2 exceeded the MCL for arsenic and the MCL/MCLG for Cadmium. Acute aquatic life criteria was exceeded for iron, copper, and zinc. Chronic aquatic life criteria was exceeded for cadmium, copper, lead and zinc. The adit discharge had a low flow rate of approximately 5 gpm and had a pH of 6.67 and a specific conductance of 355 umhos/cm. The discharge entered a small diversion ditch from Cataract Creek which flowed through WR-2 then returned to the Creek.
- Water samples from Cataract Creek were not collected during this investigation due to high relative flows. Sediment samples collected from Cataract Creek documented observed releases of arsenic, copper, lead, and antimony.

Eva May PA# 22-075  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-075-SE-1	49	33.9	0.8	2.1	3.2 J	30.2 J	5940	0.036 J	291 J	3	87 JX	11 J	174 JX	NR
22-075-SE-2	8	25.3	0.8 U	3	4.2 J	9.4 J	5870	0.022 J	240 J	3 U	14 JX	7 UJ	75 JX	NR
22-075-TP-1	1300	170	2.8	3	4.7 J	206 J	22300	0.082 J	160 J	4	1450 JX	70 J	420 JX	NR
22-075-WR-1	384	31.8	0.7	7.9	1.2 UJ	357 J	29900	0.585 J	102 J	2 U	1270 JX	165 J	60 JX	NR
22-075-WR-2	14700	4.2	11.2	1.5 U	1 UJ	56.5 J	14200	0.199 J	9.4 J	2 U	5970 JX	114 J	1660 JX	NR
BACKGROUND	140 J	193	0.7 U	9.4	14.9	71.2	21200	0.114 J	1930	11	56 J	5 U	159	< 1.227

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE POTENT. v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
22-075-TP-1	0.23	7.19	-0.2	-7.4	0.02	0.01	0.31	-0.52
22-075-WR-1DUP	2.63	82.2	-3	-85	0.15	<0.01	0	-3.02
22-075-WR-1	2.63	82.2	-3.5	-86	0.14	<0.01	0	-3.52
22-075-WR-2DUP	2.59	80.9	-3.7	-85	0.83	1.15	35.9	-39.6
22-075-WR-2	2.58	80.6	-3.9	-85	0.83	1.18	36.9	-40.8

Cation/Exchange Capacity

FIELD ID	milliequivalents/100g	% CLAY	% SAND	% SILT	% COARSE MATERIAL (>2mm)
22-075-TP-1	6.17	2	82	16	0

Mechanical Analysis and % Coarse Material

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-075-GW-1	65.9 J	132	5.93	9.7 U	6.83 U	67.2 J	1750	0.230 J	1300	12.7 U	11.7 J	30.7 U	1490	178

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-075-GW-1	260	< 5.0	72	< 0.05	NR

SE1 - Downstream Extract Creek.

SE2 - Upstream Extract Creek.

TP1 - Composite of subsample TP1A, IB, IC, and ID-A.

WR1 - Composite of subsamples WR1B and 1C.

WR2 - Sample of the WR2A subsample.

BACKGROUND - From the Crystal Mine (22-073-SS-1).

WR1DUP - Duplicate of the 22-073-WR-1 sample.

WR2DUP - Duplicate of the 22-073-WR-2 sample.

GW1 - Discharge from adit #2.

LEGEND

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Morning Glory</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>5W</u>	Section(s): <u>E 1/4, NW 1/4, Sec. 33</u>
Mining District: <u>Cataract</u>	Mine Type: <u>Hardrock/Ag, Pb, Au, Zn</u>
Latitude: <u>N 46° 19' 05"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 14' 35"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 7, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-077</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 7200 cubic yards. The following elements were elevated at least three times background:

Arsenic: 91 to 2250 mg/kg	Cadmium: 4.8 to 7.8 mg/kg
Copper: 97.3J to 150J mg/kg	Mercury: 0.188J to 0.248J mg/kg
Manganese: 5190J to 22,800J mg/kg	Nickel: 25 mg/kg
Lead: 475JX to 2070JX mg/kg	Zinc: 1140JX to 1210JX mg/kg
- The tailings oxidized zone, ranging 2 to 4 feet deep, contained significantly higher concentrations of arsenic and lead than the underlying reduced zone.
- The volume of waste rock associated with this site was estimated to be approximately 29,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 48 mg/kg	Cadmium: 1.5 mg/kg
Cobalt: 11.9 mg/kg	Copper: 33.6J mg/kg
Mercury: 0.54J mg/kg	Manganese: 3830J mg/kg
Lead: 88JX mg/kg	
- There were no adit discharges, seeps or springs associated with this site.
- Cataract Creek flowed along the base of the waste rock dumps and tailings impoundment. No surface water samples were collected due to the high dilution effect from the creek. Sediment samples were collected up and down stream of the site, as well as in Uncle Sam Creek, just above its confluence with Cataract Creek. The down stream sample (SE-2) showed significant increases in arsenic, cadmium, cobalt, copper, lead, and zinc concentrations, but due to the very high concentrations found in the Uncle Sam Creek Sample (SE-3), no observed release could be directly attributed to this site. The Crystal Mine was situated on the headwaters of Uncle Sam Creek and was probably the source of contaminants found in SE-3

Morning Glory PA# 22-077  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-077-SE-1	9	19.6	0.6 U	2.5	1.6 UJ	19.3 J	3450	0.012 U	284 J	3 U	33 JX	7 UJ	135 JX	NR
22-077-SE-2	93	19.1	4.1	10.6	1.7 J	170 J	4960	0.01 U	617 J	2 U	91 JX	6 UJ	243 JX	NR
22-077-SE-3	539	57	13.6	20.2	2.6 J	848 J	11600	0.033 J	1020 J	5	387 JX	15 J	937 JX	NR
22-077-TP-1	2250	65.4	7.8	3.1	5.5 J	150 J	17400	0.248 J	5190 J	7	2070 JX	66 J	1140 JX	NR
22-077-TP-2	91	26.4	4.8	2.4	7.2 J	97.3 J	12900	0.188 J	22800 J	25	475 JX	6 J	1210 JX	NR
22-077-WR-1	48	22.1	1.5	11.9	7.8 J	33.6 J	19900	0.54 J	3830 J	12	88 JX	6 UJ	185 JX	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE	
	TOTAL SULFUR	%	SULFUR ACID BASE	POTENT.	POTENT.	POTENT.	SULFUR	%	SULFUR	%	SULFUR	%	SULFUR	POTENT.	POTENT.	POTENT.
			v/1000t	v/1000t	v/1000t	v/1000t								v/1000t	v/1000t	v/1000t
22-077-SS-1	0.01		0.31	1.92	1.61	68.7	0.01	<0.01	0	<0.01	0	<0.01	0	1.92		1.92
22-077-TP-1	0.19		5.94	74.6	68.7	120	0.08	0.08	2.5	0.03	2.5	0.03	2.5	72.1		72.1
22-077-TP-2	0.27		8.43	128	120	50.5	0.02	0.02	6.25	0.05	6.25	0.05	6.25	122		122
22-077-WR-1	0.73		22.8	73.3	50.5	0.12	0.12	0.47	14.7	0.14	14.7	0.14	14.7	58.6		58.6

LEGEND

SE1 - Cataract Creek upgradient.  
SE2 - Cataract Creek downgradient.  
SE3 - Uncle Sam Creek at confluence with Cataract Creek.  
TP1 - Composite of subsamples TP1A-A and 1B-A.  
TP2 - Composite of subsamples TP1A-B, 1A-C, 1B-B, and 1B-C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.  
BACKGROUND - From the Morning Glory Mine (22-077-SS-1).  
SS1 - Same as the BACKGROUND sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Crescent/Alsace</u>	County: <u>Jefferson</u>
Legal Description: T <u>8N</u> R <u>5W</u>	Section(s): <u>NE 1/4, NE 1/4, Section 29</u>
Mining District: <u>Cataract</u>	Mine Type: <u>Hardrock/Pb. Ag. Zn. Au</u>
Latitude: <u>N 46° 25' 17"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 14' 45"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>August 12, 1994</u>
Inspectors: <u>Tuesday, Bisch, Flammang</u>	P.A. # <u>22-106</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 840 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Silver: 32.6 mg/kg                      Lead: 4,570 mg/kg  
Cadmium: 3.67 mg/kg                      Zinc: 618 mg/kg  
Copper: 356 mg/kg
- The volume of waste rock observed at the site was estimated to be 8,460 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Silver: 35.8 mg/kg                      Lead: 5,820 mg/kg  
Copper: 583 mg/kg                      Zinc: 340 mg/kg  
Iron: 41,300 mg/kg
- One discharging adit was observed at the site. The MCL and acute and chronic aquatic life criteria for cadmium, and the MCLG and acute and chronic aquatic life criteria for copper were exceeded in the adit discharge. Additionally, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for mercury were exceeded in the adit discharge.
- The headwaters of Cataract Creek flows directly adjacent to the site. Observed releases to Cataract Creek were documented for cadmium, copper, lead, and zinc.
- The MCL for cadmium and acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included a partially collapsed adit, an unstable loadout structure, several collapsing buildings, and various scattered wooden and metal debris.

Crescent/Aisace PA# 22-108  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/12/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-106-SE1	1.5 U	15.0	55.2	6.3	30.1	11.5	903	26300	0.08	0.04	2170	5.0 U	441	18.0 U	1200	NR
22-106-SE2	1.1 U	8.4 U	62.0	1.0 U	5.4	8.9	13.8	13800	0.04	0.06	307	3.6 U	11.0 U	12.9 U	31.2	NR
22-106-SE3	1.4 U	23.9	89.2	29.9	45.6	8.0	529	20800	0.06	0.103	4890	4.6 U	793	16.3 U	2580	NR
22-106-TP1	32.6	131 J	14.1	3.67	2.25	4.16 J	356	18500	0.09	0.29	165	4.5	4570	10.2 U	618	<0.285
22-106-WR1	35.8	218	22.5	0.7 U	1.5 U	4.5	583	41300	0.24 JX	0.19	216	2.6 U	5820	9.4 U	340	NR
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5 B	2.5 J	55.9	7500 JX	0.24 JX	0.19	442 J	3.5 U	53.3	12.5 UJ	57.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %/1000	NEUTRAL POTENT %/1000	SULFUR ACID BASE POTENT %/1000	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE %/1000	SULFUR ACID BASE POTENT %/1000
22-106-TP1	0.21	6.56	-1.51	-8.1	0.13	0.04	0.04	1.25	-2.76
22-106-WR1	0.75	23.4	-3.35	-27	0.62	0.06	0.07	1.87	-5.22

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-106-AD1	0.12	2.8	17.0	133	42.2	6.8 U	2820	602	0.18	1960	31.5	673	51.6 U	22400	85.2
22-106-SW1	0.12 U	1.1 U	14.8	24.6	13.8	6.8 U	54.2	112	0.17	904	14.4 U	16.6	51.6 U	3350	42.0
22-106-SW2	0.12 U	2.1	24.5	4.0 U	8.4 U	6.8 U	5.9 U	903	0.21	56.1	14.4 U	4.1	51.6 U	15.6 U	38.5
22-106-SW3	0.28	2.4	24.6	5.7	9.5	6.8 U	80.2	1380	0.18	619	14.4 U	100	51.6 U	539	42.1
22-106-SW4	0.12 U	1.1 U	5.5 U	4 U	8.4 U	6.8 U	5.9 U	12.3 U	0.19	2.3 U	17.0	1.3	51.6 U	15.6 U	0.1 U

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-106-AD1	218	<5	151	<0.05	NR
22-106-SW1	27	<5	40	<0.05	NR
22-106-SW2	25	<5	6.0	<0.05	NR
22-106-SW3	19	<5	6.0	<0.05	NR

LEGEND

- SE1 - Derivation of site in Coldest Creek.  
SE2 - Upgradient of mine tailings 60' above cabin.  
SE3 - Downgradient of tailings in stream by road (east side).  
TP1 - Composite of subsamples TP1A-1 through TP1D without TP1B-3.  
WR1 - Composite of subsamples WR1A, 1B, and WR2A through 2C.  
BACKGROUND - From the Josephine Mine (22-431, SE1).
- AD1 - ADE Exchange onto WR2.  
SW1 - Same as sample 22-106-SE1.  
SW2 - Same as sample 22-106-SE2.  
SW3 - Same as sample 22-106-SE3.  
SW4 - QACQ sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Boulder Chief</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>5W</u>	Section(s): <u>SW 1/4, NW 1/4, Section 27</u>
Mining District: <u>Cataract</u>	Mine Type: <u>Hardrock/Pb, Ag, Cu</u>
Latitude: <u>N 46° 19' 48"</u>	Primary Drainage: <u>Cataract Creek</u>
Longitude: <u>W 112° 12' 24"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>June 14, 1994</u>
Inspectors: <u>Bullock, Bisch, Clark, West</u>	P.A. # <u>22-132</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of mill tailings observed at the site was estimated to be 138 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 76 mg/kg	Mercury: 0.53J mg/kg
Arsenic: 186 mg/kg	Lead: 24,300 mg/kg
Cadmium: 170 mg/kg	Antimony: 105J mg/kg
Copper: 302 mg/kg	Zinc: 23,700 mg/kg
- The volume of waste rock observed at the site was estimated to be 14,225 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 3.2 to 17.8 mg/kg	Mercury: 0.83J mg/kg
Cadmium: 9.5J to 13.6J mg/kg	Manganese: 10,100 mg/kg
Copper: 158 mg/kg	Lead: 364 to 7680 mg/kg
Zinc: 883 to 1060 mg/kg	
- One discharging adit was observed at the site; however, the discharge had no measurable flow at the time of the investigation (standing water) and eventually seeped into a waste rock dump (WR2) after a relatively short surface expression. A sample was collected for field parameters only; the pH was 3.0 and S.C. was 497 uS/cm.
- Observed releases to an unnamed tributary of Cataract Creek were documented for lead and zinc. The MCL for cadmium was exceeded in the tributary as were the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc. These exceedances were directly attributable to the site.
- Visual impacts to terrestrial vegetation were observed for approximately 1/4-mile downgradient from the site. The stressed vegetation was due to eroding waste rock and tailings (likely occurring during snowmelt and high runoff precipitation events).
- Potential safety hazards observed at the site included an open pit (fenced) with a 30-foot highwall and a collapsing, wooden loadout structure.

**Boulder Chief PA# 22-132**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/14/94**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-132-SE1	0.6 U	7.0	45.6	9.1 J	5.1	5.2	17.6	8500	0.03 U	396	7.9	156	6.4 UJ	1140	NR
22-132-SE2	0.7 U	11.3	93.7	0.9 J	7.8	8.2	22.2	13000	0.05 J	709	11.9	16.3	7.3 UJ	45.8	NR
22-132-SE3	24.2	37.8	44.5	69.4 J	5.6	3.0	71.1	8780	0.06 J	1830	4.9	2130	27.7 J	9420	NR
22-132-TP1	76	186	8.5	170 J	1.3 U	0.7 U	302	9300	0.53 J	51	1.5	24300	105 J	23700	NR
22-132-WR1	4.9	10.9	113	13.6 J	9.8	1.0 U	27.2	29700	0.07 J	10100	5.3	364	6.0 UJ	883	NR
22-132-WR2	17.8	26.7	90.2	9.5 J	2.7	2.5	158	13300	0.83 J	556	5.8	7880	5.1 UJ	1060	NR
22-132-WR3	3.2	19.8	126	0.6 J	2.3	2.2	31.4	12600	0.06 J	239	2.4	723	4.5 UJ	30.2	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE %	SULFUR ACID BASE POTENT. %
22-132-TP1	3.67	115	-5.14	-120	0.42	1.06	2.19	33.1	-36.3
22-132-WR1	0.04	1.25	3.44	2.19	0.04	<0.01	<0.01	0.00	3.44
22-132-WR2	0.51	15.9	3.66	-12	0.30	0.03	0.18	0.94	2.73
22-132-WR3	0.06	1.87	-0.04	-1.9	0.05	0.01	<0.01	0.31	-0.35

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-132-SW1	0.12 U	3.5	9.9	5.1	8.7 U	5.5	4.6 U	200	0.11 U	7.1	8.0 U	21.9	29.4 U	806	28.9
22-132-SW2	0.12 U	4.0	10.6	2.6 U	8.7 U	4.7 U	4.6 U	151	0.11 U	6.4	8.0 U	1.9	29.4 U	4.5 U	24.2
22-132-SW3	2.15	5.6	10.4	35.1	8.7 U	4.7 U	8.7	479	0.11 U	40.7	8.0 U	289	29.4 U	6300	33.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-132-SW1	91	<5	15	<0.05	NR
22-132-SW2	82	<5	8.0	<0.05	NR
22-132-SW3	121	<5	40	<0.05	NR

**LEGEND**

SE1 - Downstream in tributary to Cement Creek below confluence with mine discharge.  
 SE2 - Upstream in tributary to Cement Creek above confluence with mine discharge.  
 SE3 - FFB of mine discharge with tributary to Cement Creek.  
 TP1 - Composite of subsamples TP1A and 1B.  
 WR1 - Composite of subsamples WR1A and 1B.  
 WR2 - Composite of subsamples WR2A, 2B, and 2C.  
 WR3 - Composite of subsamples WR3A and 3B.

BACKGROUND - From the Boulder Chief Mine (22-132-SE1).  
 SW1 - Same as sample 22-132-SE1.  
 SW2 - Same as sample 22-132-SE2.  
 SW3 - Same as sample 22-132-SE3.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Rocker/Ada  
Legal Description: T 7N R 5W  
Mining District: Cataract  
Latitude: N 46° 21' 52"; N 46° 21' 44"  
Longitude: W 112° 14' 48"; W 112° 15' 12"  
Land Status: Private/Public  
Quad: Basin and Mount Thompson  
Inspectors: Bullock, Bisch, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Jefferson  
Section(s): SW 1/4, NE 1/4, Section 17  
Mine Type: Hardrock/Au, Ag, Pb  
Primary Drainage: Cataract Creek  
USGS Code: 10020006  
Secondary Drainage: Rocker Creek  
Date Investigated: June 16, 1994  
P.A. # 22-170

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 7,525 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 6.7 to 116 mg/kg	Mercury: 0.26J to 1.25J mg/kg
Arsenic: 601JX to 1,190JX mg/kg	Lead: 1,030JX to 5,440JX mg/kg
Cobalt: 34.2 mg/kg	Antimony: 42.3J to 631J mg/kg
Copper: 159J to 1,030J mg/kg	Iron: 55,500J mg/kg
- Multiple discharging adits were observed at the site during the investigation: the MCL for arsenic was exceeded in AD-1, AD-2, and AD-4; the MCLs for cadmium and copper were exceeded in AD-1 and AD-5; and the MCL for antimony was exceeded in AD-1. Additionally, acute and chronic aquatic life criteria for copper and zinc were exceeded in all the adit discharges at the site.
- Several of the adit discharges flowed directly into Rocker Creek. Observed releases to Rocker Creek were documented for arsenic, copper, and zinc. Acute and chronic aquatic life criteria for copper and zinc were exceeded in Rocker Creek downstream from the site. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included a partially open shaft and a collapsing headframe and loadout structure.
- Vehicular access to this site is not possible. The site which is spread out over an area exceeding 3/4-mile in length can be reached by hiking approximately 1/2-mile along a well-marked trail.

**Rocker/ADA PA# 22-170**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/16/94**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	Au (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-170-SE1	0.5 U	135 JX	32.0	3.1 JX	34.2	4.9 J	305 J	14800 J	0.07 J	1650 JX	4.3	93.1 JX	5.5 UJ	258	NR
22-170-SE2	0.6 U	14.8 JX	76.6	0.8 JX	8.2	10.3 J	6.6 J	15900 J	0.06 J	604 JX	2.0	30.7 JX	6.6 UJ	33.6	NR
22-170-WR1	92	797 JX	28.3	1.6 JX	1.6	1.9 J	159 J	31800 J	1.25 J	106 JX	1.4 U	2120 JX	123 J	77.6	NR
22-170-WR2	116	1190 JX	32.2	1.8 JX	34.2	0.8 UJ	1030 J	55500 J	0.26 J	21.1 JX	4.1	3690 JX	631 J	42.4	NR
22-170-WR3	67	1010 JX	17.6	1.3 JX	2.0 U	2.2 J	245 J	17200 J	0.51 J	148 JX	1.9 U	1030 JX	42.3 J	121	NR
22-170-WR4	40.4	601 JX	18.2	0.5 UJ	1.5 U	0.8 UJ	270 J	14100 J	0.52 J	8.0 JX	1.4 U	5440 JX	61.4 J	63.5	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR			SULFUR ACID BASE			PYRITIC SULFUR			SULFUR ACID BASE			SULFUR ACID BASE		
	%	U/1000	POTENT.	%	U/1000	POTENT.	%	U/1000	POTENT.	%	U/1000	POTENT.	%	U/1000	POTENT.
22-170-WR1	0.61	19.1	-3.67	-23	0.56	-0.01	0.05	0.00	-3.67	0.00	0.00	-3.67	0.00	0.00	-3.67
22-170-WR2	3.83	120	-9.13	-129	0.88	1.33	41.5	-50.7	-50.7	0.00	0.00	-50.7	0.00	0.00	-50.7
22-170-WR3	0.15	4.69	-2.22	-6.9	0.14	-0.01	0.01	0.00	-2.22	0.00	0.00	-2.22	0.00	0.00	-2.22
22-170-WR4	0.33	10.3	-3.15	-14	0.30	0.01	0.02	0.31	-3.46	0.00	0.00	-3.46	0.00	0.00	-3.46

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	Au	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-170-AD1	26.3 JX	3310	10.9	47.9	245	4.7 U	6170	147000	0.11 U	11800	42.4	256	58.7	6810	138
22-170-AD2	0.19 JX	79.9	2.1 U	2.6 U	8.7 U	4.7 U	16.4	140	0.11	7.6	8.0 U	1.8	29.4 U	234	27.2
22-170-AD3	0.12 UX	47.2	23.8	2.6 U	8.7 U	4.7 U	22.2	6200	0.11 U	1560	9.8	10.5	29.4 U	239	65.3
22-170-AD4	0.31 JX	82.7	4.9	2.6 U	8.7 U	4.7 U	17.3	839	0.13	381	8.0 U	16.6	29.4 U	138	7.7
22-170-AD5	0.20 JX	2.9	21.6	24.5	53.4	4.7 U	1600	6900	0.11 U	2250	15.2	20.5	29.4 U	3930	69.8
22-170-SW1	0.12 UX	11.9	6.3	4.4	8.7 U	4.7 U	51.7	692	0.11	68.9	8.0 U	1.1 U	29.4 U	56.1	15.0
22-170-SW2	0.12 UX	3.9	9.6	2.6 U	8.7 U	4.7 U	4.6 U	373	0.16	26.9	8.0 U	1.6	29.4 U	4.5 U	10.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-170-AD1	669	<5	521	<0.05	NR
22-170-AD2	59	<5	15	<0.05	NR
22-170-AD3	88	<5	30	<0.05	NR
22-170-AD4	7.0	<5	<5	<0.05	NR
22-170-AD5	218	<5	117	<0.05	NR
22-170-SW1	45	<5	8.0	<0.05	NR
22-170-SW2	13	<5	<5	<0.05	NR

**LEGEND**

- SE1 - Downstream Rocker Creek.
- SE2 - Upstream Rocker Creek.
- WR1 - Composite of subsamples WR1A, WR1B, WR1C, and WR1D.
- WR2 - Grab sample of the WR2 subsample.
- WR3 - Composite of subsamples WR3 and WR4.
- WR4 - Grab sample of the WR10 subsample.
- BACKGROUND - From the Boulder Creek Valley (22-132-SE1).
- AD1 - Discharge associated with WR6 flow over east side of WR6 and flow into ground off from dump.
- AD2 - Discharge from AD1 #5 and WR7 on path west of main workings (WR6).
- AD3 - Discharge associated with WR3 on the south side of the creek.
- AD4 - Discharge from the upstream side near new cable.
- AD5 - Rocker site off discharge.
- SW1 - Same as sample 22-170-SE1.
- SW2 - Same as sample 22-170-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Nellie Grant  
Legal Description: T 8N R 5W  
Mining District: Clancy  
Latitude: N 46° 26' 16"  
Longitude: W 112° 12' 07"  
Land Status: Private/Public  
Quad: Chessman Reservoir  
Inspectors: Bullock, Tuesday, Babits, Lasher,  
Clark, Belanger, Flammang/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Jefferson  
Section(s): SW 1/4, SW 1/4, Sec. 14  
Mine Type: Hardrock/Au, Ag, Cu, Pb, Zn  
Primary Drainage: Lump Gulch  
USGS Code: 10030101  
Secondary Drainage: Lump Gulch  
Date Investigated: May 18 and 19, 1993  
P.A. # 22-244

- There were approximately 10,000 cubic yards of uncovered tailings on site. The following elements were elevated at least three times background:

Arsenic: 4,210 to 9,500 mg/kg	Cadmium: 10.8 to 312 mg/kg
Cobalt: 27 to 28.8 mg/kg	Chromium: 19.7J to 26J mg/kg
Copper: 50.5 to 467 mg/kg	Iron: 29, 500 to 61,400 mg/kg
Mercury: 0.106J to 0.235J mg/kg	Nickel: 36.6 to 37.3 mg/kg
Lead: 9,380 to 13,500 mg/kg	Zinc: 763 to 33,700 mg/kg
- There were approximately 2,500 cubic yards of uncovered waste rock on site. The following elements were elevated at least three times background:

Arsenic: 969 to 2,570 mg/kg	Cadmium: 7.6 to 9.2 mg/kg
Cobalt: 10.8 mg/kg	Copper: 87.2 to 143 mg/kg
Iron: 33.600 mg/kg	Mercury: 0.156J to 0.184J mg/kg
Lead: 7,410 to 15,500 mg/kg	Zinc: 417 to 934 mg/kg
- There were no discharging adits on site. There were three shafts that did not discharge; but, held water. Shaft #3 was sampled as GW-3 and pH 3.51 and a specific conductance of 640 umhos/cm. Arsenic and cadmium exceeded MCL/MCLGs. There were two monitoring wells on site that were potentially downgradient (GW-3 and 4) and one spring (GW-1) that was upgradient. There were observed releases of arsenic, cadmium, cobalt, copper, iron, nickel, lead, and zinc in GW-3 and cadmium and zinc in GW-4. The MCL/MCLGs were exceeded for cadmium in GW-3 and 4 and the MCL was exceeded for arsenic in GW-3.
- Lump Gulch Creek ran through eroded tailings. There were observed releases of cadmium and zinc in downstream surface water in the creek. Cadmium exceeded MCL/MCLGs in downstream surface water in the creek. The acute and chronic aquatic life criteria for copper, lead, and zinc were exceeded in downstream surface water in the creek. Elevated upgradient metal concentrations (SW-1) indicated the possible presence of an upgradient source.

**Nellie Grant Mine PA# 22-244**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER-BULLOCK**  
**INVESTIGATION DATE: 05/18/93 & 05/19/93**

**SOLID MATRIX ANALYSES**

Results per dry weight basis (mg/kg)

Metals in soils

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
22-244-SE-1	599	43.9	6.4	8.65	1.82 J	39.4	6860	0.122 J	1780	7.06	744	4.17 UJ	393	NR
22-244-SE-2	879	26.1	1.6	1.37 U	1.15 U	27.3	7540	0.034 J	102	2.01 U	1190	4.2 UJ	202	NR
22-244-SE-3	354	284	56.1	8.35	13.7 J	231	20700	0.274 J	763	7.16	995	10.9 UJ	2310	NR
22-244-SE-4	488	40	7.0	8.18	1.14 U	42.3	5660	0.114 J	1920	8.63	561	4.16 UJ	440	NR
22-244-TA-1	4210	46.7	10.8	1.41 U	2.36 J	50.5	29500	0.111 J	46.9	2.59	9380	4.32 UJ	763	NR
22-244-TA-2	9330	53.2	312.0	28.8	19.7 J	467	57500	0.235 J	758	36.6	13500	31 J	33700	NR
22-244-TA-3	9500	95.3	190.0	27	26 J	321	61400	0.106 J	589	37.3	9670	12.6 J	21200	NR
22-244-WR-1	969	48.5	9.2	1.31	0.936 U	87.2	6490	0.184 J	8.61	1.64 U	15500	6.74 J	934	1.07U
22-244-WR-3	2570	81.2	7.6	10.8	2.99 J	143	33600	0.156 J	73.7	1.75 v	7410	3.65 UJ	417	NR
BACKGROUND	10	52.7	1.3	3.15	2.23 J	6.12	6390	0.035 J	284	2.6	21.9	3.4 UJ	43.6	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL	NEUTRAL POTENTIAL	SULFUR ACID BASE POTENTIAL	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL	SULFUR ACID BASE POTENTIAL
22-244-TA-1	1.49	46.5	-4.47	-51.0	0.10	0.06	1.87	-6.35
22-244-TA-2	8.95	280	5.17	-274	2.88	3.56	111	-106
22-244-TA-3	6.97	218	-2.24	-220	1.82	4.84	151	-153
22-244-WR-1	3.00	93.7	-12.7	-106	1.08	0.78	24.4	-37
22-244-WR-3	1.33	41.5	-17.9	-59.5	0.17	0.09	2.81	-20.7
0	3.05	95.3	-12.1	-107	1.11	0.76	23.7	-35.9

**LEGEND**

SE1 - Lump Gulch @ culvert N. of main access road to logging/mine.  
 SE2 - 1/2 way down center drainage @ edge of slurred tailings.  
 SE3 - Outlet of pond S. of access road in Lump Gulch.  
 SE4 - Lump Gulch Creek in tailings deposit downstream of SW1.  
 TPI - Sample of the subsample TPI-A1.  
 TP2 - Sample of the subsample TPI-B1.  
 TP3 - Sample of the subsample TPI-B2.  
 WR1 - composite of the subsamples WRD2LRT, LTLT, RTRT, and RLTL  
 WR3 - Composite of the subsamples WRD3-1, 3-3, and 3-4.  
 BACKGROUND - From the Nellie Grant (22-244-SS-1).  
 WRIDUP - Duplicate of the sample 22-244-WR-1.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**WATER MATRIX ANALYSES**

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn(mg CaCO3/L)
22-244-GW-1	5.85	5.8	2.57	5.99 U	12.1 J	5 J	125	0.19 J	2.77	8.78 U	1.85	18.3 U	6 U 9.98
22-244-GW-2	3.85	28.3	2.55 U	5.99 U	8.37 J	1.35 U	831	0.21 J	486	8.78 U	1.36 U	18.3 U	6 U 86.7
22-244-GW-3	53.4	33.2	107	132	13.4 J	369 J	9270	0.13 J	3520	29.5	1090	18.3 U	12700 111
22-244-GW-4	4.28	22.5	82.9	5.99 U	5 U	5.2 J	13.5 U	0.091 J	1320	20	1.38	18.3 U	10600 190
22-244-SW-1	123	21.2	4.37	5.99 U	7.73 J	17.1 J	1770	0.19 J	501	8.78 U	98.5	18.3 U	315 14.1
22-244-SW-2	45.4	19.9	559	71.8	15.3 J	720 J	3830	0.21 J	9860	87	316	57.4	58900 309
22-244-SW-3	20.6	20	263	5.99 U	5 U	19.1 J	312	0.22 J	130	10.9	18.2	18.3 U	2110 27.3

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-244-GW-1	70	< 5.0	< 5	< 0.05	NR
22-244-GW-2	153	< 5.0	16	< 0.05	NR
22-244-GW-3	289	< 5.0	171	< 0.05	NR
22-244-GW-4	345	< 5.0	175	< 0.05	NR
22-244-SW-1	64	< 5.0	15	< 0.05	NR
22-244-SW-2	817	< 5.0	491	< 0.68	NR
22-244-SW-3	90	< 5.0 g	49	< 0.05	NR

**LEGEND**

GW1 - Background spring, approximately 35 yards.  
 GW2 - Monitoring well furthest South along access road.  
 GW3 - Shaft #3, East of building.  
 GW4 - Monitoring well furthest North along access road.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Same as sample SE3.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: General Grant  
Legal Description: T 8N R 5W  
Mining District: Clancy  
Latitude: N 46° 26' 16"  
Longitude: W 112° 12' 07"  
Land Status: Private/Public  
Quad: Chessman Reservoir  
Inspectors: Bullock, Babits, Flammang,  
Lasher, Clark/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Jefferson  
Section(s): SW 1/4, SW 1/4, Sec. 15  
Mine Type: Hardrock/Pb, Zn  
Primary Drainage: Lump Gulch  
USGS Code: 10030101  
Secondary Drainage: Lump Gulch  
Date Investigated: May 19, 1993  
P.A. # 22-245

- There were no tailings on site.
- There were approximately 1,580 cubic yards of waste rock on site. The following elements were elevated at least three times background:  
Arsenic: 2,320 to 5,130 mg/kg      Copper: 55.4 mg/kg  
Mercury: 0.244J to 0.542J mg/kg      Lead: 3,810 to 5,400 mg/kg  
Zinc: 444 mg/kg
- There were no discharging mine openings on site. There was one filled shaft that did not discharge. This shaft was sampled as GW-1 and had a pH 6.47 and specific conductance of 100 umhos/cm. Cadmium exceeded the MCL/MCLG in this sample.
- There was no surface water on site. The nearest surface water was one mile away. No surface water or sediment samples were collected.
- The shaft was hazardous mine openings, but was covered with an AMRB grate.

General Grant PA# 22-245  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/19/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-245-WR-1	2320	55.6	3.4	1.26 U	1.05 U	112	10300	0.244 J	79.5	1.84 U	3810	3.84 UJ	444	NR
22-245-WR-2	5130	44.4	1.9	1.12 U	2.42 J	55.4	7970	0.572 J	2.8	1.64 U	5400	4.1 J	66	NR
BACKGROUND	10	52.7	1.3	3.15	2.23 J	6.12	6390	0.035 J	284	2.6	21.9	3.4 UJ	43.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	ACID BASE	POTENT.
22-245-WR-1	0.59	18.4	-4.75	-23.2	0.51	0.02	0.06	0.62	0.05	-5.37						
22-245-WR-2	0.51	15.9	-2.46	-18.4	0.47	<0.01	0.05	0.00		-2.46						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-245-GW-1	10.7	46.7	6.3	5.99 U	5.67 J	1.87 J	693	0.14 J	568	8.78 U	17.2	18.3 U	773	33.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-245-GW-1	96	< 5.0	26	18	NR

LEGEND

WR1 - Composite of subsamples WR1-1 and 1-3.

WR2 - Composite of subsamples WR2-1, 2-2, and 2-3.

BACKGROUND - From the Nellie Grant Mine (22-244-SS-1).

GW1 - Discharge from shaft #1 at General Grant.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Alta</u>	County: <u>Jefferson</u>
Legal Description: <u>T 7N R 4W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 10</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Hardrock/Au, Pb, Ag, Fe, Zn, Cu</u>
Latitude: <u>N 46° 22' 24"</u>	Primary Drainage: <u>Prickly Pear</u>
Longitude: <u>W 112° 05' 12"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Spring Creek</u>
Quad: <u>Wickes</u>	Date Investigated: <u>August 17, 1993</u>
Inspectors: <u>Bullock, Belanger/Pierson</u>	P.A. # <u>22-001</u>
Organization: <u>Pioneer Technical Services, Inc./</u>	
<u>Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- Water discharging from the base of WR-1 was apparently a discharge from the main level shaft. This discharge constituted the start of flow in a small, unnamed tributary to Spring Creek. The discharge flow was approximately 10 gpm, pH was measured at 2.59, and specific conductance was 420 umhos/cm. Arsenic, cadmium, copper, nickel, and antimony exceeded MCLs and MCLGs. Acute aquatic life criteria were exceeded for arsenic, iron, cadmium, copper, and zinc. Chronic aquatic life criteria were exceeded for arsenic, mercury, cadmium, copper, and zinc.
- Approximately 175,000 cubic yards of waste rock material was located at this site. The volume of waste rock material was roughly estimated due to the large surface area on complex terrain and severe erosion. The following elements were elevated at least three times background:  
  
Arsenic: 249J to 658J mg/kg  
Lead: 3100J to 15, 100J mg/kg
- Severe erosion was occurring on several of the waste rock dumps.

Alta PA# 22-001  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-001-SE-1	821 J	97.4 J	1.3 J	2.8 J	4.1 J	230 JX	49900 J	0.12	291 J	6 J	1170 J	6 U	613 JX	NR
22-001-SE-2	46 J	120 J	0.5 U	5 J	8.9 J	32.3 JX	14300 J	0.049	761 J	10 J	96 J	6 U	120 JX	NR
22-001-WR-1	249 J	67.1 J	0.5 U	1.8 U	2.4 J	217 JX	30100 J	0.428	291 J	4 J	3940 J	6 U	366 JX	NR
22-001-WR-2	658 J	61.5 J	1.1 J	1.7 U	1.2 U	193 JX	23700 J	0.366	18.3 J	2 J	15100 J	5 U	328 JX	NR
22-001-WR-3	293 J	57 J	0.6 J	1.9 U	1.3 U	122 JX	12800 J	0.437	710 J	39 J	3100 J	6 U	205 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000	NEUTRAL POTENT 1/1000	SULFUR ACID BASE POTENT 1/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT 1/1000
22-001-WR-1	2.8	87.5	-0.6	-88	2.62	0.03	0.15	0.94	-1.58
22-001-WR-2	2.88	90	-3	-93	0.94	1.26	0.68	39.4	-42.4
22-001-WR-3DUP	0.88	27.5	-1.4	-29	0.84	<0.01	0.05	0	-1.44
22-001-WR-3	0.87	27.2	-1.6	-29	0.82	<0.01	0.06	0	-1.62

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-001-SW-1	1270	2.01 U	892 J	206	78.5	16200 J	368000	0.21 J	390000	117	26.3	329	289000	1230

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested; ND - No Data

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-001-SW-1	5810	ND	3450	< 0.05	NR

LEGEND

- SE1 - At single stream below waste rock dump 1.  
SE2 - Upgradient of site.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 1D, and 1E.  
WR2 - Composite of subsamples WR2, 3, and 4.  
WR3 - Composite of subsamples WR5, 6, 7, and 8.  
BACKGROUND - From the Bertha Mine (22-002-SS-1).  
WR3DUP - Duplicate of sample 22-001-WR-3.
- SW1 - Same as sample SE1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Bertha  
Legal Description: T 7N R 4W  
Mining District: Colorado  
Latitude: N 46° 22' 55"  
Longitude: W 112° 05' 10"  
Land Status: Private  
Quad: Jefferson City  
Inspectors: Bullock, Flammang, Clark  
Organization: Pioneer Technical Services, Inc.

County: Jefferson  
Section(s): S 1/4, Sec. 3  
Mine Type: Hardrock/Cu, Pb, Ag, Au, Zn  
Primary Drainage: Little Prickly Pear  
USGS Code: 10030101  
Secondary Drainage: Spring Creek  
Date Investigated: July 12, 1993  
P.A. # 22-002

- This site was reclaimed by the MDSL/AMRB in 1987. Waste rock dumps and tailings ponds were almost completely revegetated.
- The volume of tailings associated with this site was roughly estimated at 115,000 cubic yards. Accurate estimation of volume was difficult due to covering and grading activities that occurred during the reclamation activities. The following elements were elevated at least three times background:  
Copper: 2270J to 6320J mg/kg      Mercury: 0.209 to 1.34 mg/kg  
Antimony: 8J to 21J mg/kg
- The volume of waste rock at this site was roughly estimated at 19,000 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 21.3 mg/kg      Copper: 998J to 2290J mg/kg  
Mercury: 0.345 to 2.62 mg/kg      Lead: 8170J mg/kg  
Antimony: 8J to 21J mg/kg
- Spring Creek flowed along the reclaimed waste rock and tailings impoundments. Observed releases to Spring Creek (sediment) were documented for cadmium, copper, lead, and zinc. No MCLs or MCLGs were exceeded in Spring Creek water samples. Acute aquatic life criteria were exceeded for iron both up and down stream of the site. The unnamed tributary coming into Spring Creek from the northwest contained elevated levels of cadmium (25.80J ug/l), copper (1540 ug/l), lead (81.7 ug/l), and zinc (2920J ug/l). MCLs and MCLGs were exceeded for cadmium and copper in this tributary. Acute aquatic life criteria were exceeded for iron, cadmium, copper, and zinc. Chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc. Stream flows were approximately 40 gpm in Spring Creek and 30 gpm in unnamed tributary. The pH and specific conductance of Spring Creek below the site was measured at 7.8 and 367 umhos/cm, respectively. The pH and specific conductance of the unnamed tributary was measured at 8.15 and 333 umhos/cm, respectively.

**Bertha PA# 22-002**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/22/83**

**SOLID MATRIX ANALYSES**

**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-002-SE-1	19 J	37.4	3.9	8.5	7 J	395 J	15100	0.015	740	7 J	223 J	6 UJ	739	NR
22-002-SE-2	78 J	51.6	2.7	8.1	11.3 J	186 J	29800	0.022	412	9 J	168 J	7 UJ	384	NR
22-002-SE-3	33 J	46.7	1.2	10.8	9.9 J	78.1 J	22400	0.014	476	10 J	68 J	6 UJ	121	NR
22-002-TP-1	90 J	34.7	7.6	6.4	1.5 U	6320 J	35400	1.34	1120	9 J	588 J	21 J	1200	NR
22-002-TP-2	44 J	32.7	3	4.1	3.6 J	2270 J	17400	0.209	485	5 J	245 J	8 J	371	NR
22-002-WR-1	420 J	70.9	21.3	3.6	1.1 U	2290 J	45700	2.62	362	2 U	8170 J	25 J	2520	NR
22-002-WR-2	30 J	38.7	4.4	7.7	3.8 J	998 J	27000	0.345	607	10 J	292 J	6 UJ	472	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
22-002-TP-1	3.6	112	38.2	-74	0.81	2.56	80	-41.7
22-002-TP-2DUP	0.59	18.4	3.86	-15	0.19	0.05	1.56	2.3
22-002-TP-2	0.6	18.7	3.89	-15	0.16	0.09	2.81	1.08
22-002-WR-1	4.19	131	-11	-142	1.44	0.91	28.4	-39.3
22-002-WR-2	2.33	72.8	104	31.6	0.7	0.44	13.7	90.7

**WATER MATRIX ANALYSES**

**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-002-SW-1	9.14 J	19.90	3.27 J	9.70 U	6.83 U	19.80	7220 JX	0.120	158	12.7 U	2.87	30.7 U	62.5 J	178
22-002-SW-2	10.91 J	81.20	25.80 J	9.70 U	6.83 U	1540	3710 JX	0.110	1620	22.5	81.7	30.7 U	2920 J	324
22-002-SW-3	5.58 J	73.30	2.57 U	9.70 U	6.83 U	19.00	2770 JX	0.150	153	12.7 U	15.1	30.7 U	109 J	211

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-002-SW-1	526	< 5.0	253	< 0.05	NR
22-002-SW-2	352	< 5.0	115	< 0.05	NR
22-002-SW-3	340	< 5.0	113	< 0.05	NR

**LEGEND**

SE1 - Spring Creek immediately downstream of tailings pond 2.  
 SE2 - Unnamed tributary to Spring Creek which flows past Northern workings.  
 SE3 - Spring Creek upstream of tailings pond 1.  
 TP1 - Sample of the TP1A sub-sample.  
 TP2 - Composite of subsamples TP3A-A, 3A-B, 3B-A, 3B-B, 3B-C, 3B-D, and 3C-A through 3C-C.  
 WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A and 2B.

BACKGROUND - From the Bertha Mine (22-002-SB-1).  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bluebird</u>	County: <u>Jefferson</u>
Legal Description: <u>T 7N R 5W</u>	Section(s): <u>N 1/2, All 1/4, Sec. 13</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Hardrock//Au, Ag</u>
Latitude: <u>N 46° 21' 32"</u>	Primary Drainage: <u>Spring Creek</u>
Longitude: <u>W 112° 10' 00"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Curtain Gulch</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 8, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>22-003</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 70,550 cubic yards. The following elements were elevated at least three times background:

Arsenic: 100JX to 587JX mg/kg	Copper: 441 mg/kg
Mercury: 0.407J mg/kg	Lead: 4,990 mg/kg
Zinc: 1,910 mg/kg	
- Three discharging adits were identified at the site during the investigation; all of these discharges entered Curtain Creek. One sample was collected for laboratory analysis. MCLs for arsenic, cadmium, and copper were exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, and zinc and chronic aquatic life criteria were exceeded for iron and lead.
- Curtain Creek flowed directly through two waste rock dumps at the site. Observed releases to Curtain Creek were documented for arsenic, copper, and zinc. The MCL for cadmium was exceeded in the downstream surface water sample; however, the exceedance was not attributable to the site. Acute and chronic aquatic life criteria for copper and zinc were exceeded in the downstream sample; these exceedances were directly attributable to the site.
- One potentially hazardous partially collapsed shaft was identified at the site.

Blue Bird PA# 22-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-003-WR-1	587 JX	50.6	1.4	14.2	19.8	441	47000	0.407 J	1440 J	11	4990	11 J	1910	NR
22-003-WR-2	100 JX	37.1	0.5 U	4	3.9	18.9	31400	0.102 J	584 J	3 U	29	6 UJ	45	NR
BACKGROUND	28 JX	123	0.7	14.9	24.3	50.4	25400	0.052 J	1810 J	14	258	5 UJ	255	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE		PYRITIC ACID BASE		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
22-003-WR-1	1.06	33.1	9.94	78.6	-23	0.92	0.12	0.62	0.12	0.08	0.94	0.62	9.31	77.7
22-003-WR-2	0.21	6.56			72	0.1	0.03	0.94						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-003-SW-1	142	12.1	25.1	16.2	6.83 U	1620 J	19000 J	0.038 U	4590 JX	12.7 U	8.21 JX	30.7 U	3600 J	206
22-003-SW-2	264 J	4.93	2.57 U	9.7 U	6.83 U	3.13 J	29.9	0.210 J	4.08 U	12.7 U	6.81 J	30.7 U	7.57 U	37.4
22-003-SW-4	31.7	8.77	12.2	9.7 U	9.33 J	605 J	4700 J	0.038 U	1390 JX	12.7 U	13 JX	30.7 U	1540 J	113

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-003-SW-1	375	< 5.0	173	< 0.05	NR
22-003-SW-2	91	< 5.0	11	0.05	NR
22-003-SW-4	217	< 5.0	81	< 0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.  
WR2 - Composite of subsamples WR3A, 3B, 3C, and 4.  
BACKGROUND - 300 feet above discharging edit.  
From Bluebird Mine (22-003-SS-1).

SW1 - At uppenite edit discharge.  
SW2 - At uppenite spring headwaters.  
SW4 - The downgradient spring sample after confluence with three edit discharges.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Corbin Flats</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>4W</u>	Section(s): <u>S 1/2, Sec. 1</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Mill/Cu, Pb, Zn</u>
Latitude: <u>N 46° 23' 13"</u>	Primary Drainage: <u>Prickly Pear Creek</u>
Longitude: <u>W 112° 02' 30"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Spring Creek</u>
Quad: <u>Jefferson City</u>	Date Investigated: <u>July 12, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>22-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of partially revegetated tailings associated with this site was estimated to be approximately 700,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 975J to 1,270J mg/kg	Manganese: 17,500 to 20,400 mg/kg
Cadmium: 61.7 to 104 mg/kg	Lead: 7,540J to 15,500J mg/kg
Copper: 897J to 2,010J mg/kg	Antimony: 104J to 194J mg/kg
Mercury: 0.31 to 1.45 mg/kg	Zinc: 9,360 to 13,500 mg/kg
- Spring Creek was observed flowing directly through the tailings; although, it appeared that previous attempts were made to reroute the creek to the north of the tailings. The MCL for cadmium was exceeded in both upstream and downstream samples from Spring Creek; the MCL for arsenic was exceeded in the downstream sample. Acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for mercury were exceeded in both upstream and downstream samples. Acute and chronic aquatic life criteria for lead and the chronic aquatic life criteria for iron were exceeded in the downstream sample. Metals concentrations measured in upstream and downstream sediment samples were very similar to background concentrations.
- Observed releases to Spring Creek were documented for arsenic and lead. The MCL exceedance for arsenic and the acute and chronic aquatic life criteria exceedances for lead in the downstream sample were directly attributable to the site.
- A residential well located adjacent to and downgradient from the site was sampled during the investigation. No MCLs were exceeded.
- Several residences were located near the site, and the area was observed being used for recreational purposes during the investigation. The site had a high potential for hazardous dust propagation.

Corbin Flats PA# 22-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/12/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-004-SE-1	104 J	34.5	3.2	4.3	4.5 J	76.6 J	12800	0.104	458	5 J	223 J	6 UJ	506	NR
22-004-SE-2	63 J	20.3	3.3	3	1.6 U	161 J	9460	0.026	1320	3 J	204 J	7 UJ	561	NR
22-004-TP-1	1270 J	66.5	61.7	2.6	2.3 J	897 J	20400	0.31	20400	20 J	7540 J	104 J	9360	NR
22-004-TP-2	975 J	87.9	104	5.1	4.2 J	2010 J	27800	1.45	17500	19 J	15500 J	194 J	13500	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		SULFUR	
	SULFUR %	ACID BASE U/1000r	NEUTRAL POTENT. U/1000r	ACID BASE POTENT. U/1000r	SULFATE %	SULFUR %	SULFUR %	ACID BASE POTENT. U/1000r	SULFUR %	ACID BASE POTENT. U/1000r
22-004-TP-1	1.5	46.9	3.2	-44	0.59	0.56	0.35	17.5	0.75	-14.3
22-004-TP-2	2.66	83.1	66.6	-17	0.84	1.07	0.75	33.4		33.2

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-004-GW-1	9.12 J	30.70	4.03 J	9.70 U	6.83 U	3.70	76.1 JX	0.120	18.1	12.7 U	3.95	30.7 U	66.8 J	197
22-004-SW-1	20.51 J	8.40	241 J	11.00	6.83 U	233	630 JX	0.095	8580	59.3	17.3	44.1	26300 J	536
22-004-SW-2	103	50.6	25.1 J	9.7 U	7.97	348	6530	0.094	8830	12.7 U	960	30.7 U	5630	215

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-004-GW-1	686	< 5.0	156	< 0.05	NR
22-004-SW-1	326	< 5.0	144	0.36	NR
22-004-SW-2	406	< 5.0	206	0.24	NR

LEGEND

- SE1 - Upstream in Spring Creek  
SE2 - Downstream of tailings in Spring Creek  
TP1 - Composite of subsamples TP1A-A, 1B-1 through 1B-3, and 1C-1 through 1C-4  
TP2 - Composite of subsamples TP1D-1 through 1D-4, BACKGROUND - From the Bertha Mine (22-002-S9-1).  
GW1 - Residential well  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Gregory</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>4W</u>	Section(s): <u>N 1/2, Sec. 4</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Hardrock/Pb, Zn, Au, Ag</u>
Latitude: <u>N 46° 23' 14"</u>	Primary Drainage: <u>Clancy Creek</u>
Longitude: <u>W 112° 06' 48"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Clancy Creek</u>
Quad: <u>Jefferson City</u>	Date Investigated: <u>August 17, 1993</u>
Inspectors: <u>Bullock, Belanger, Pierson</u>	P.A. # <u>22-005</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- Approximately 10,000 cubic yards of tailings were associated with this site. The following elements were elevated at least three times background:  
Arsenic: 5870J mg/kg
- The volume of waste rock at this site was approximately 30,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 770J to 1060J mg/kg  
Mercury: 0.412 to 0.544 mg/kg  
Lead: 4910J to 11500J mg/kg
- Erosion of waste rock and tailings into drainages was occurring.
- An observed release to Clancy Creek was documented for lead. Also, the acute aquatic life criteria for copper was exceeded in Clancy Creek, which was directly attributable to the site. Observed releases to the unnamed tributary of Clancy Creek were documented for arsenic and lead. The MCL for cadmium was also exceeded in this tributary; however, the exceedance could not be attributed to the site. The pH of Clancy Creek dropped from 7.73 to 7.58 between the up- and down-gradient sample locations. Specific conductance increased from 190 to 240 umhos/cm. The unnamed tributary made up less than 5 percent of the flow of Clancy Creek at this location.

Gregory PA# 22-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils			Results per dry weight basis											
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
222-005-SE-3	5820 J	92.1 J	6.6 J	5.67 U	8.67	331	90700	0.208	334	7.4 U	2180 J	17.9 U	1060 J	NR
222-005-SE-5	22 J	125 J	0.5 U	6.5 J	11.1 J	14.1 JX	13200 J	0.039	908 J	30 J	83 J	6 U	158 JX	NR
222-005-TP-1	5870 J	81.2 J	1.4 J	1.8 J	4.4 J	161 JX	21700 J	0.063	60.8 J	6 J	577 J	5 U	195 JX	NR
222-005-TP-2	1740 J	104 J	0.8 J	4.3 J	8.2 J	204 JX	19700 J	0.04	705 J	5 J	347 J	7 U	273 JX	NR
222-005-WR-1	1080 J	45.5 J	4.1 J	3 J	1.2 U	453 JX	35500 J	0.457	163 J	14 J	11500 J	5 U	1090 JX	NR
222-005-WR-2	381 J	90.4 J	0.6 U	2.1 U	1.5 U	168 JX	30100 J	0.412	70.5 J	8 J	4910 J	7 U	220 JX	NR
222-005-WR-3	770 J	101 J	0.6 J	2.3 J	8 J	129 JX	58400 J	0.544	181 J	9 J	6790 J	6 U	563 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR
Acid/Base Accounting														
TOTAL														
TOTAL	SULFUR	ACID BASE	NEUTRAL	SULFUR	SULFATE	PYRITIC	ORGANIC	PYRITIC	SULFUR	ACID BASE	SULFUR	ACID BASE	POTENT.	
FIELD	SULFUR	ACID BASE	POTENT.	ACID BASE	SULFUR	SULFUR	SULFUR	SULFUR	ACID BASE	ACID BASE	POTENT.	POTENT.		
ID	%	V/1000	V/1000	V/1000	%	%	%	V/1000	V/1000	V/1000	V/1000	V/1000		
22-005-TP-1	0.48	15	-6.7	-22	0.46	<0.01	0.02	0	-6.73					
22-005-TP-2	0.29	9.06	-3.3	-12	0.24	0.01	0.04	0.31	-3.61					
22-005-WR-1	3.98	124	-7.3	-132	1.75	1.52	0.71	47.5	-54.8					
22-005-WR-2	1.87	58.4	-3.7	-82	0.94	0.47	0.46	14.7	-18.4					
22-005-WR-2DUP	1.9	59.4	-3.3	-83	0.98	0.43	0.49	13.4	-16.7					
22-005-WR-3	2.1	65.6	-5.8	-71	2.03	0.01	0.06	0.31	-6.1					
22-005-WR-3DUP	2.13	66.5	-6.3	-73	2.05	0.01	0.07	0.31	-6.34					

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water			Results in ug/L												
FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC.	
22-005-SW-1	4.45	7.13	2.93 J	9.7 U	6.83 U	39.5 J	146	0.27 J	591	12.7 U	14.4	30.7 U	640	89.2	
22-005-SW-2	3.17	5.8	3 J	9.7 U	6.83 U	2.5 J	105	0.22 J	91.9	15.5	0.75	30.7 U	31.1	76	
22-005-SW-3	30.3	20.2	84.9 J	33.7	8.07	1020 J	10800	0.34 J	14000	22.3	200	36.5	14900	316	
22-005-SW-4	216	2.01 U	135 J	38.8	6.83 U	2230 J	51700	0.39 J	9670	31.7	48.1	30.7 U	20400	156	
22-005-SW-5	4.81	43.7	2.57 U	9.7 U	6.83 U	1.55 U	510	0.29 J	133	14.6	3.73	30.7 U	29.9	177	

Wet Chemistry

TOTAL

DISSOLVED

SOLIDS

FIELD ID

161

131

851

878

260

CHLORIDE

< 5.0

< 5.0

< 5.0

< 5.0

< 5.0

SULFATE

58

30

556

586

97

NO3/NO2-N

< 0.05

< 0.05

0.07

< 0.05

< 0.05

CYANIDE

NR

NR

NR

NR

NR

SE3 - Downstream tributary sample above culvert

SE3 - Upgradient tributary sample

TP1 - Sample of the TP1 subsample

TP2 - Composite of subsample TP2A and 2B

WR1 - Composite of subsamples WR1A through 1E, and 2A through 2C

WR2 - Composite of subsamples WR3A through 3C

WR3 - Composite of subsamples WR4A and 4B

BACKGROUND - From the Bertha Mine (22-002-SS-1)

WR2DUP - Duplicate of the 22-005-WR-2 sample

WR3DUP - Duplicate of the 22-005-WR-3 sample

SW1 - Clancy Creek downstream from tailings and confluence

SW2 - Upstream Clancy Creek at Pegagus gaging station

SW3 - Downstream tributary sample above culvert

SW4 - Mouth of small Northern tributary coming downstream of waste rock dump 2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Washington  
Legal Description: T 7N R 4W  
Mining District: Colorado  
Latitude: N 46° 21' 39"  
Longitude: W 112° 08' 14"  
Land Status: Private  
Quad: Mount Thompson  
Inspectors: Bullock, Belanger, Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Jefferson  
Section(s): SW 1/4, NW 1/4, Sec. 17  
Mine Type: Hardrock/Au, Ag, Cu, Pb, Zn  
Primary Drainage: Prickly Pear Creek  
USGS Code: 10030101  
Secondary Drainage: Spring Creek  
Date Investigated: August 16, 1993  
P.A. # 22-007

- The volume of tailings associated with this site was estimated to be approximately 86,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 9180J to 11,000J mg/kg	Cadmium: 31.9J to 68.9J mg/kg
Iron: 95,700J to 101,000J mg/kg	Mercury: 0.207 mg/kg
Lead: 4310J to 5830J mg/kg	Antimony: 43 mg/kg
Zinc: 5660JX to 10700JX mg/kg	
- Tailings were actively eroding into this tributary of Spring Creek.
- The volume of waste rock associated with this site was estimated to be approximately 36,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2410J to 3250J mg/kg	Cadmium: 16.4J to 20.8J mg/kg
Mercury: 0.384 to 0.39 mg/kg	Lead: 2330J to 4420J mg/kg
Antimony: 19 mg/kg	Zinc: 5660JX to 10700JX mg/kg
- Two adit discharges were associated with this site, making up all of the flow of this tributary of Spring Creek during mid-summer, low-flow conditions. Both adit discharges exceeded the MCL for arsenic. Acute aquatic life criteria were exceeded for iron and zinc at both adits and for arsenic at Adit #1. Chronic aquatic life criteria were exceeded for zinc at both adits and also for arsenic and cadmium at Adit #1. Adit discharge pH measurements were 7.86 and 7.27 for Adit #1 and Adit #2, respectively.
- This tributary to Spring Creek flowed intermittently above the adit discharges and below it flowed through the waste rock and tailings. Observed releases were observed for arsenic, lead and zinc. The chronic aquatic life criteria for lead was exceeded and was directly attributed to this site. The upgradient surface water sample indicated the presence of an upgradient contaminant source.

Washington PA# 22-007  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-007-SE-1	5100	28.4	32.7 J	7.2	8.6	156	46400	0.084	3210	9	2280	34	5080	NR
22-007-SE-2	44	29.9	2.6 J	12.6	32.6	33.6	22900	0.028 U	875	21	133	6 U	184	NR
22-007-TP-1	9180 J	20.8 J	31.9 J	13.2 J	7.6 J	293 JX	95700 J	0.207	2770 J	19 J	5830 J	43	5660 JX	NR
22-007-TP-2	11000 J	13.3 J	68.9 J	17.7 J	19.9 J	280 JX	101000 J	0.08	6360 J	24 J	4310 J	6 U	10700 JX	NR
22-007-WR-1	2410	26.6	16.4 J	5.6	7.9	53.8	30900	0.384	1470	6	2330	16	2970	NR
22-007-WR-2	3250	24.1	20.8 J	4.3	3.9	67.2	33700	0.39	987	6	4420	19	3010	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31800	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		TOTAL ACID BASE		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
22-007-TP-1	11.7	366	47.5	-318	10.2	1.65	319	-271	10.2	1.65	319	-271	10.2	1.65	319	-271	10.2	1.65
22-007-TP-2	10.6	331	124	-207	10.8	2.35	337	-213	10.8	2.35	337	-213	10.8	2.35	337	-213	10.8	2.35
22-007-TP-2DUP	10.3	322	124	-199	10.8	2.38	337	-214	10.8	2.38	337	-214	10.8	2.38	337	-214	10.8	2.38
22-007-WR-1	4.89	153	48.6	-104	1.38	3.41	43.1	5.54	1.38	3.41	43.1	5.54	1.38	3.41	43.1	5.54	1.38	3.41
22-007-WR-2	4.13	129	29.0	-100	0.41	1.33	12.8	16.2	0.41	1.33	12.8	16.2	0.41	1.33	12.8	16.2	0.41	1.33

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-007-GW-1	621	21.2	2.57 U	9.7 U	9.57 J	2.03	3660 J	0.260 J	1740 JX	12.7 U	2.35	30.7 U	336	245
22-007-GW-2	172	21.5	2.57 U	10.6	6.83 U	3.3	17700 J	0.160 J	3630 JX	12.7 U	4.27	30.7 U	2230	367
22-007-SW-1	1080	12.8	36.2	9.7 U	6.83 U	56.9 J	7310	0.140	5130	33.5	471	32.7	10800	478
22-007-SW-2	59.3	9.87	32.7	9.7 U	6.83 U	13.5 J	950	0.120 U	4090	28	2.51	30.7 U	9980	438
22-007-SW-3	2.43	78.1	27.3	9.7 U	6.83 U	58.8 J	55.7	0.120 U	982	27.8	3.26	30.7 U	3920	182

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-007-GW-1	343	< 5.0	132	< 0.05	NR
22-007-GW-2	512	< 5.0	318	< 0.05	NR
22-007-SW-1	776	< 5.0	498	< 0.05	NR
22-007-SW-2	712	< 5.0	1140	< 0.05	NR
22-007-SW-3	325	< 5.0	193	< 0.05	NR

LEGEND

- SE1 - In stream approx. 300' downstream of tailings pond 4.
- SE2 - Between tailings and waste rock at road.
- TP1 - Composite of subsamples TP1A-A through 1A-C, 2A-A through 2A-D, and 3A-A through 3A-C.
- TP2 - Composite of subsamples TP4A-A through 4A-C, and 4B-C.
- WR1 - Composite of subsamples WR1A, 1B, and 2A through 2C.
- WR2 - Composite of subsamples WR3A, 3B, and 4.
- TP2DUP - Duplicate of the 22-007-TP-2 sample.
- BACKGROUND - From the Bertha Mine (22-002-S5-1).
- GW1 - Discharge from adit #1.
- GW2 - Discharge from adit #2.
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Upgradient of site approx. 200 feet.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Crawley Camp  
Legal Description: T 7N R 4W  
Mining District: Colorado  
Latitude: N 46° 22' 04"  
Longitude: W 112° 09' 30"  
Land Status: Private  
Quad: Mount Thompson  
Inspectors: Bullock, Bisch, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Jefferson  
Section(s): SW 1/4, SW 1/4, Section 7  
Mine Type: Hardrock/Unknown  
Primary Drainage: Clancy Creek  
USGS Code: 10030101  
Secondary Drainage: Clancy Creek  
Date Investigated: June 13, 1994  
P.A. # 22-028

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 2,800 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 2.8 to 114 mg/kg	Mercury: 0.43J mg/kg
Arsenic: 73.7 to 459 mg/kg	Lead: 553 to 1820 mg/kg
Copper: 75.4 mg/kg	Antimony: 1,150J mg/kg
- The two waste rock dumps associated with this site are situated directly in the floodplain of Upper Clancy Creek. Additionally, the discharging adit associated with the site flowed directly into Upper Clancy Creek. The MCL for arsenic, the acute aquatic life criteria for zinc, and the chronic aquatic life criteria for copper, iron, lead, and zinc were all exceeded in the adit discharge.
- An observed release to Upper Clancy Creek was documented for arsenic. The chronic aquatic life criteria for lead was exceeded in both the upstream and downstream samples, and the chronic aquatic life criteria for iron was exceeded in the downstream sample.
- Potential safety hazards observed at the site included two partially collapsed cabins (low hazard potential).

**Crawley Camp PA# 22-028**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/13/84**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-028-SE1	1.5 U	949	395	46.4 J	61.4	22.1	460	117000	0.12 J	37300	27.4	278	67.0 J	6440	NR
22-028-SE2	0.8 U	21.6	41.1	1.2 J	10.4	16.3	14.7	16500	0.04 U	603	10.0	30.2	8.4 UJ	72.4	NR
22-028-WR1	114	459	47.8	2.5 J	1.7 U	1.1	75.4	20300	0.07 J	28.9	2.1	1820	1150 J	228	NR
22-028-WR2	2.8	73.7	23.7	1.3 J	1.4 U	0.7 U	33.8	8250	0.43 J	12	1.2 U	553	6.0 J	58.8	NR
BACKGROUND	0.6 U	23.1	178	2.0 J	9.7 B	3.9	23.1	13600	0.04 J	1280	3.4	42.3	6.4 UJ	120	NR

U - Not Detected, J - Estimated Quality, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE V/1000	NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE V/1000	SULFUR ACID BASE POTENT. V/1000
22-028-WR1	0.74	23.1	-4.72	-28	0.32	0.05	0.37	1.56	-6.28
22-028-WR2	0.19	5.94	-3.10	-9	0.18	<0.01	0.01	0.00	-3.10

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-028-AD1	0.43	50.8	5.7	2.6 U	8.7 U	4.7 U	12.9	5870	0.11 U	386	8.0 U	9.8	29.4 U	140	75.0
22-028-SW1	0.12 U	16.8	2.7	2.6 U	8.7 U	4.7 U	4.6 U	1390	0.11 U	225	8.0 U	4.7	29.4 U	75.9	72.1
22-028-SW2	0.12 U	4.0	3.6	2.6 U	8.7 U	4.7 U	4.6 U	370	0.11 U	20.7	8.0 U	2.9	29.4 U	4.7	53.7

U - Not Detected, J - Estimated Quality, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-028-AD1	116	<5	32	<0.05	NR
22-028-SW1	125	<5	32	<0.05	NR
22-028-SW2	80	<5	5.0	<0.05	NR

**LEGEND**

SE1 - Downstream in Upper Cherry Creek; Iron staining from acid discharge; no vegetation.  
 SE2 - Upstream in Upper Cherry Creek.  
 WR1 - Composite of subsamples WR1A and 1B.  
 WR2 - Composite of subsamples WR2A and 2B.  
 BACKGROUND - From the Boulder Chief Mine (22-132-SB1).  
 AD1 - All discharge/leak above WR2.  
 SW1 - Same as sample 22-028-SE1.  
 SW2 - Same as sample 22-028-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Argentine</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>5W</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 2</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 23' 20"</u>	Primary Drainage: <u>Clancy Creek</u>
Longitude: <u>W 112° 11' 53"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>South Fork Quartz Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>August 16, 1993</u>
Inspectors: <u>Bullock, Belanger, Pierson</u>	P.A. # <u>22-102</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 26,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 259J mg/kg	Manganese: 2540 mg/kg
Lead: 785J to 7640J mg/kg	Zinc: 610J to 1490J mg/kg
- Three of the adits had minor discharges, although only the adit associated with WR-2 had significant flow. Water samples were collected from this adit (GW-2) and from the adit associated with WR-1 (GW-1). The MCL/MCLG for cadmium was exceeded in GW-1. Acute aquatic life criteria were exceeded for iron, cadmium, copper, lead and zinc in GW-1, and for iron and zinc in GW-2. Chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc in GW-1 and for zinc in GW-2.
- An unnamed tributary to the South Fork of Spring Creek bisects the site. Vegetative buffer strips were present between the stream and the waste rock dumps. Observed releases were documented for manganese, lead, and zinc. There were no MCLs or MCLGs exceeded; however, acute and chronic aquatic life criteria were exceeded for zinc and were directly attributable to the site.

**Argentine PA# 22-102**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/16/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-102-SE-1	27	41.8	3.4 J	4.1	3.5	34.7	9900	0.04 U	2620	3	449	7 U	439	NR
22-102-SE-2	6 U	13.8	0.7 U	2.5 U	3.4	3.4	5790	0.037 U	146	3 U	35	8 U	30	NR
22-102-WR-1	55.6 J	72.7 J	2.6 J	8.94	6.89	97.3	23000	0.032 U	2540	6.69	785 J	7.54 U	610 J	NR
22-102-WR-2	259 J	22.6 J	8.6 J	3.16	1.47	231	23300	0.056	877	2.41 U	7640 J	5.84 U	1490 J	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID/BASE U/1000x	NEUTRAL POTENT. U/1000x	ACID/BASE POTENT. U/1000x	SULFATE %	SULFUR %	ACID/BASE %	SULFUR %	ACID/BASE U/1000x	SULFATE %	ACID/BASE POTENT. U/1000x	ACID/BASE POTENT. U/1000x
22-102-WR-1	0.15	4.69	4.99	0.3	0.03	0.04	0.08	1050 J	0.190 J	0.120 J	3110 JX	3.74
22-102-WR-2	2.43	75.9	-7.2	-83	1.35	0.76	0.32	139 J	0.140 J	1600 JX	7.5 JX	-30.9

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-102-GW-1	1.49 U	2.01 U	7.63	9.7 U	6.83 U	26.5	1050 J	0.190 J	3110 JX	12.7 U	106	30.7 U	729	19.2
22-102-GW-2	1.49 U	16.7	2.57 U	9.7 U	6.83 U	3.27	3190 J	0.120 J	9110 JX	13.8	4.36	30.7 U	3990	415
22-102-SW-1	3.15	5.33	2.77	9.7 U	6.83 U	7.67	138 J	0.140 J	1600 JX	12.7 U	17	30.7 U	385	41.4
22-102-SW-2	2.18	4.8	2.57 U	9.7 U	6.83 U	2.47	66.5 J	0.118 U	7.5 JX	14.5	1.97	30.7 U	8.83	28.9

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-102-GW-1	79	< 5.0	24	< 0.05	NR
22-102-GW-2	643	< 5.0	338	< 0.05	NR
22-102-SW-1	102	< 5.0	22	< 0.05	NR
22-102-SW-2	72	< 5.0	6	< 0.05	NR

**LEGEND**

- SE1 - Downgradient of site.  
 SE2 - Upgradient of site.  
 WR1 - Composite of subsamples WR1B, 1C, and 2B.  
 WR2 - Composite of subsamples WR1A and 2A.  
 BACKGROUND - From the Enterprise Mine (22-074-SS-1).
- GW1 - Associated with waste rock dump 1.  
 GW2 - Associated with waste rock dump 3.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Wickes Smelter</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>4W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 15</u>
Mining District: <u>Colorado</u>	Mine Type: <u>Smelter/Cu, Zn, Pb</u>
Latitude: <u>N 46° 21' 06"</u>	Primary Drainage: <u>Spring Creek</u>
Longitude: <u>W 112° 06' 01"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Finn Gulch Creek</u>
Quad: <u>Wickes</u>	Date Investigated: <u>August 17, 1993</u>
Inspectors: <u>Bullock, Belanger, Pierson</u>	P.A. # <u>22-358</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- Contaminant sources at this site were associated with historic smelting activities and included possible kiln dust, clinker, and slag. The volume of waste material associated with this site was roughly estimated at 2000 to 4000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 613J to 4290J mg/l	Cadmium: 26.6J mg/kg
Mercury: 3.18 to 20.9 mg/kg	Lead: 9400J to 31,700J mg/kg
Antimony: 20 to 26 mg/kg	Zinc: 2960JX to 19,000JX mg/kg
- The high mercury measurement was obtained in a sample of the suspected flue dust material directly north of the stack.
- Finn Gulch, a small intermittent tributary to Spring Creek, bisects the site. The drainage was dry at the time of this investigation. Sediment samples were collected up and down gradient of the site. An observed release of mercury to this drainage was documented.
- The town of Wickes was adjacent to this site. Direct contact hazards were considered significant, especially with regard to small children .

Wickes Tailings PA# 22-358  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-358-SE-1	77 J	38.9 J	1.5 J	3.7 J	4 J	188 JX	11200 J	4.8	354 J	4 J	700 J	5 U	384 JX	NR
22-358-SE-2	33 J	66.4 J	0.5 U	6.9 J	5 J	237 JX	16800 J	0.035 U	574 J	8 J	344 J	6 U	256 JX	NR
22-358-WR-1	613 J	67.9 J	15.7 J	18.9 J	5.7 J	6450 JX	65400 J	3.18	2940 J	8 J	25600 J	20	19000 JX	NR
22-358-WR-2	789 J	109 J	8.7 J	10.4 J	9.6 J	2370 JX	31900 J	20.9	1020 J	6 J	9400 J	26	6040 JX	NR
22-358-WR-3	4290 J	25.9 J	26.6 J	4.4 J	5.9 J	3780 JX	33500 J	35.2	467 J	3 J	31700 J	22	2960 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	SULFUR %	ACID BASE 1/1000	POTENT. 1/1000	NEUTRAL. 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR %	POTENT. 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR %	POTENT. 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR %	POTENT. 1/1000
22-358-WR-1	1.82	56.9	0.46	0.47	-63	-6.5	0.89	0.46	0.47	-63	14.4	0.46	0.89	0.46	14.4	0.46	0.89	0.46
22-358-WR-2	0.77	24.1	0.07	0.44	-18	5.91	0.26	0.07	0.44	-18	2.19	0.07	0.26	3.72	2.19	0.07	0.26	3.72
22-358-WR-3	2.38	74.4	0.15	1.8	-72	2.48	0.43	0.15	1.8	-72	4.69	0.15	0.43	-2.21	4.69	0.15	0.43	-2.21

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-358-GW-1	0.96 U	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	37.8	0.18 J	18.2	12.7 U	1.13	30.7 U	15.9	0.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND

- SE1 - Downgradient of site.
- SE2 - Upgradient of site.
- WR1 - Sample from the WR4 subsample.
- WR2 - Sample from the WR2 subsample.
- WR3 - Sample from the WR1 subsample.
- BACKGROUND - From the Bertha Mine (22-002-SS-1).

GW1 - QA/QC Blank



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Elkhorn Queen</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 26</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Zn, Cu</u>
Latitude: <u>N 46° 14' 46"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 56' 42"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>South Fork Queen</u>
Quad: <u>Tacoma Park</u>	Gulch
Inspectors: <u>Babits, Flammang, Lasher</u>	Date Investigated: <u>August 16, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>22-027</u>

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 23,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 10,100J mg/kg	Cadmium: 405J mg/kg
Cobalt: 28.4 mg/kg	Iron: 112,000 mg/kg
Mercury: 0.441 mg/kg	Nickel :19.1 mg/kg
Lead: 40,200J mg/kg	Antimony: 64.6J mg/kg
Zinc: 20,000J mg/kg	
- There were no discharging adits, filled shafts, seeps, or springs identified at the site during the investigation.
- The South Fork of Queen Gulch was the nearest surface water to the site, which was located approximately 1,000 feet to the north. No surface water or sediment samples were collected due to the lack of a direct runoff route.
- Potential safety hazards identified at the site included an open shaft (with a headframe and loadout structure) and an open adit .

Elkhorn Queen PA# 22-027  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-027-WR-1	10100 J	118 J	405 J	28.4	2.38	87.6	112000	0.441	2590	19.1	40200 J	64.6 J	20000 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.039	1170	6.23	38.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL SULFUR %	ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR v/1000x	ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
22-027-WR-1	4.24	132	38.0	-94.4	<0.01	3.08	2.06	96.2	-58.2	

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From Tacoma (22-284-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Queen/Tourmaline Queen</u>	County: <u>Jefferson</u>
Legal Description: T <u>6N</u> R <u>3W</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 22</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 15' 00"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 111° 57' 00"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Elkhorn Creek</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>August 16, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>22-111</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 80,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 1,420J mg/kg      Iron: 87,600 mg/kg
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
- Elkhorn Creek was flowing approximately 20 feet from the toe of WR-1. Surface water and sediment samples were collected upstream and downstream from the site. Chronic aquatic life criteria were exceeded for mercury and lead in both the upstream and downstream samples. Contaminant concentrations were not elevated in the downstream samples (surface water or sediment) when compared to the upstream samples.
- No hazardous mine openings or structures were identified at the site.

Queen PA# 22-111  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-111-SE-1	156 J	37 J	45.1 J	4.17	9.32	279	14700	23.4	1570	5.36	2010 J	110 J	6880 J	NR
22-111-SE-2	140 J	17.8 J	36.3 J	2.47 U	6.29	212	14400	14.6	1050	4.81	1800 J	103 J	6140 J	NR
22-111-WR-1	1420 J	37.4 J	1.2 J	14.3	12.5	33.4	87600	0.032 U	395	5.93	73.4 J	4.73 U	167 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.039	1170	6.23	38.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	ORGANIC SULFUR %	PYRITIC SULFUR v/1000	PYRITIC ACID BASE POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000
22-111-WR-1	0.47	14.7	1.90	-12.8	0.38	<0.01	0.09	1.90

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-111-SW-1	3.42	10.6	2.57 U	9.7 U	6.83 U	5.77 J	300	0.44 J	21.5	12.7 U	22.8	30.7 U	65.2	62.7
22-111-SW-2	4.39	11.1	2.57 U	9.7 U	6.83 U	4.03 J	262	0.36 J	18.9	12.7 U	21.7	30.7 U	58.4	61.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-111-SW-1	108	< 5.0	10	< 0.05	NR
22-111-SW-2	114	< 5.0	10	0.08	NR

LEGEND

SE1 - Upstream on Elkhorn Creek.  
SE2 - Downstream on Elkhorn Creek.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From Tacoma (22-284-SS-1).  
SW1 - Same as SE1.  
SW2 - Same as SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Tacoma</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 34</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 46° 13' 58"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 57' 47"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Tacoma Gulch</u>
Quad: <u>Tacoma Park</u>	Date Investigated: <u>August 16, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>22-284</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 7,320 cubic yards. The following elements were elevated at least three times background:

Arsenic: 177J mg/kg	Cadmium: 3.9 J to 12J mg/kg
Mercury: 0.175 to 0.507 mg/kg	Lead: 1,320J to 23,600J mg/kg
Zinc: 859J to 1,530J mg/kg	
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- An unnamed, minor, intermittent drainage (dry at the time of the investigation) was situated through the center of the site; however, no sediment samples were collected.
- Seven potentially hazardous open (or partially open) adits were identified at the site.

**Tacoma PA# 22-284**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/16/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-284-WR-1	177 J	168 J	12.0 J	6.97	1.39 U	334	30200	0.507	900	2.66	23600 J	6.34 J	1530 J	NR
22-284-WR-2	35.2 J	158 J	3.9 J	7.67	2.09	25.4	19100	0.175	835	2.66 U	1320 J	6.45 U	859 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.039	1170	6.23	38.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000t	NEUTRAL POTENT. /1000t	SULFUR ACID BASE POTENT. /1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE /1000t	SULFUR ACID BASE POTENT. /1000t
22-284-WR-1	0.03	0.94	14.3	13.3	0.02	<0.01	0.01	0.00	14.3
22-284-WR-2	0.01	0.31	42.8	42.5	<0.01	<0.01	0.01	0.00	42.8

**LEGEND**

WR1 - Composite of subsamples WR1, 2A, 2B, 5, and 6.  
 WR2 - Composite of subsamples WR7, 8, and 9.  
 BACKGROUND - From Tacoma (22-284-SS-1)

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Sourdough</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 10</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Fe, Au</u>
Latitude: <u>N 46° 17' 00"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 57' 37"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Greyback Gulch</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>August 20, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>22-336</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings on site.
- There were approximately 32,450 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:  
Arsenic: 105 to 560 mg/kg                      Copper: 336 to 750 mg/kg  
Mercury: 0.848 mg/kg
- There was a discharging adit on site and it did not enter the creek by a surface route. The sample had a pH of 6.56. Cadmium exceeded the MCL/MCLG.
- The creek ran adjacent to waste rock. There was an observed release of copper in downstream surface water. No MCL/MCLGs were exceeded in downstream surface water. The chronic aquatic life criteria for lead was exceeded in downstream surface water, which was directly attributable to the site.
- There were five open adits and one highwall on site.

**Sourdough PA# 22-336**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/20/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-336-SE-1	5.72 U	14.9	1.1 UJ	2.01 J	11.9 J	7.9	6070	0.062	148	5.37 J	7.84 U	7.56 U	11.8	NR
22-336-SE-2	46.2	72.4	1.1 UJ	13.3 J	36.3 J	203	20000	0.104	606	19.6 J	16.8	7.58 U	72.3	NR
22-336-WR-1	560	25.1	0.8 UJ	14.6 J	5.76 J	750	13500	0.044	1030	12.9 J	36.2	5.69 U	249	NR
22-336-WR-2	535	29.9	1.0 UJ	18.3 J	7.18 J	701	51800	0.056	770	6.54 J	70.6	6.57 U	126	NR
22-336-WR-3	105	29.3	0.7 UJ	15.3 J	13.8 J	336	24900	0.848	640	14 J	32.7	4.96 U	173	NR
BACKGROUND	76.1	157	0.7 UJ	15.5 J	55.6 J	64.1	24500	0.118	1260	33.5 J	86.7	4.86 U	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR ACID BASE		ORGANIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
22-336-WR-1	0.02	0.62	79.8	79.2	<0.01	0.01	0.02	0.31	0.02	0.31	79.5	79.5
22-336-WR-2	0.56	17.5	13.9	-3.6	0.38	0.06	0.12	1.87	0.12	1.87	12	12
22-336-WR-3	0.05	1.56	31.9	30.3	0.01	<0.01	0.04	0	0.04	0	31.9	31.9

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-336-SW-1	3.33 J	5	2.57 U	9.7 U	6.83 U	1.55 U	50.3 J	0.12 U	8.77	12.7 U	1.55 U	30.7 U	7.57 U	65.4
22-336-SW-2	2.47 J	5.87	2.57 U	9.7 U	8.73 J	6.5 J	145 J	0.12 U	11.7	12.7 U	2.24	30.7 U	7.57 U	70.4
22-336-SW-3	8.82 J	2.01 U	8.6	148	6.83 U	1120 J	34000 J	0.12 U	7460	35.4	1.55 U	30.7 U	429	470

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-336-SW-1	99	< 5.0	11	< 0.05	NR
22-336-SW-2	80	< 5.0	7	< 0.05	NR
22-336-SW-3	684	< 5.0	467	0.31	NR

**LEGEND**

- SE1 - Upgradient approx. 300' from waste rock dump 4.  
 SE2 - Downgradient approx. 50' from base of waste rock dump 5.  
 WR1 - Composite of subsamples WR2, 3A, and 3B.  
 WR2 - Composite of subsamples WR4A, 4B, 4C, and 4D.  
 WR3 - Composite of subsamples WR5A, 5B, and 5C.  
 BACKGROUND - North side of Greyback Creek.  
 From Sourdough Mine (22-336-SS-1).
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Add discharge of waste rock dump 5.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Carmody</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>SW 1/4, NW 1/4, Section 14</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 16' 20"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 57' 05"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Slaughterhouse Gulch</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>August 4, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>22-337</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 15,615 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 1.7J to 88.1J mg/kg	Iron: 95,500 to 108,000 mg/kg
Arsenic: 272 to 841 mg/kg	Mercury: 0.40 to 138 mg/kg
Cadmium: 5.1 to 175 mg/kg	Lead: 5,540 to 13,100 mg/kg
Cobalt: 52.7J mg/kg	Antimony: 487J to 1,170J mg/kg
Copper: 494 to 1,250 mg/kg	Zinc: 278 to 29,500 mg/kg
- Significantly high concentrations of cyanide were detected in TP-1 (4,704 mg/kg) and TP-3 (3,075 mg/kg).
- The volume of waste rock observed at the site was estimated to be 2,475 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 1.7J mg/kg	Iron: 138,000 mg/kg
Arsenic: 1,560 mg/kg	Mercury: 1.00 mg/kg
Cadmium: 6.6 mg/kg	Lead: 53.5 mg/kg
Copper: 616 mg/kg	
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Slaughterhouse Gulch flows through the center of the site. Observed releases to Slaughterhouse Gulch were documented for iron, lead, and zinc. No MCLs were exceeded in Slaughterhouse Gulch; however, the chronic aquatic life criteria for cadmium, copper, iron, and lead were exceeded in downstream samples. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site includes two open (but fenced) shafts, two open adits, three small open pits, and various collapsing wooden and metal structures.

Carmody PA# 22-337  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 08/04/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-337-SE1	1.4 U	377	66.2	4.5	23.4 J	12.2	425	69400	0.20	682 JX	11.1	60.5	16.8 UJ	293	NR
22-337-SE2	0.8 U	73.7	51.2	1.3	7.7 J	4.7	112	21200	0.16	407 JX	4.9	31.7	9.3 UJ	67.0	NR
22-337-SE3	59.5 J	110	28.1	14.8	4.1 J	4.9	289	13600	72.0	287 JX	4.1	2410	205 J	6400	NR
22-337-SE4	22.5 J	57.1	46.9	19.3	6.7 J	13.6	110	16300	23.4	430 JX	14.0	1110	45.6 J	2060	NR
22-337-TP1	88.1 J	272	15	175	4.5 J	2.3	494	11600	7.53	2340 JX	6.1	5540	487 J	14700	4.704
22-337-TP2	1.7 J	448	223	6.4	18.7 J	38.1	1070	108000	0.10	285 JX	19.2	25.6	10.3 UJ	278	0.378
22-337-TP3	1.8 J	841	64.5	5.1	52.7 J	17.4	1210	95500	0.40	1210 JX	16.9	32.7	11.9 UJ	618	3.075
22-337-TP4	75.9 J	368	40.1	88.9	1.9 J	3.8	1250	16800	138	850 JX	5.5	13100	1170 J	29500	<0.285
22-337-WR1	1.7 J	1560	143	6.6	11.7 J	43.6	616	138000	1.00	434 JX	12.9	53.5	10.3 UJ	145	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3 J	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 UJ	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000t	SULFUR ACID BASE POTENT. v/1000t
22-337-TP1	<0.01	0.00	196	196	<0.01	0.10	0.03	3.12	193
22-337-TP2	1.64	51.2	1.02	-50	1.50	0.09	0.05	2.81	-1.80
22-337-TP3	0.12	3.75	77.5	73.8	0.05	0.04	0.03	1.25	76.3
22-337-TP4	0.07	2.19	118	116	0.05	<0.01	0.02	0.00	118
22-337-WR1	1.79	55.9	-0.82	-57	1.73	0.01	0.05	0.31	-1.13

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC (mg CaCO3/L)
22-337-GW1	0.12 U	5.2	5.5	4.0 U	8.4 U	6.8 U	5.9 U	53.7	0.13 JX	2.3 U	14.4 U	0.4 U	51.6 U	17.8	176
22-337-SW1	0.12 U	11.9	14.1	4.0 U	8.4 U	6.8 U	17.6	1420	0.08 UJ	38.0	15.7	2.4	51.6 U	19.8	126
22-337-SW2	0.12 U	8.0	11.2	4.0 U	8.4 U	6.8 U	7.9	402	0.17 JX	21.4	14.4 U	0.9	51.6 U	15.6 U	125
22-337-SW3	0.23	11.4	12.7	4.2	8.4 U	6.8 U	10.0	481	0.29 JX	17.3	20.2	21.3	51.6 U	49.2	129

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-337-GW1	184	<5.0	37	0.28	<0.005
22-337-SW1	98	<5.0	8.0	<0.05	<0.005
22-337-SW2	111	<5.0	8.0	<0.05	<0.005
22-337-SW3	114	<5.0	8.0	<0.05	<0.005

LEGEND

- SE2 - Upgradient in Sloughhouse Gulch; 15' above residence.  
SE3 - Downgradient; below TP4 on Elkhorn Creek and above steel mill building.  
SE4 - In Elkhorn Creek upgradient of confluence with Sloughhouse Gulch.  
TP1 - Composite of subsamples TP1A-1, 1B-1, and 1C-1.  
TP2 - Composite of subsamples TP2A through 2A-C and TP2B-A and 2B-B.  
TP3 - Composite of subsamples TP3A, TP3B-A through 3B-C.  
TP4 - Composite of subsamples TP4A through 4D.  
WR1 - Composite of subsamples WR1A through 4B.
- GW1 - Well located possibly downgradient of TP1 & upgradient of the rest outside fence on pump.  
SW1 - Same as sample 22-337-SE1.  
SW2 - Same as sample 22-337-SE2.  
SW3 - Same as sample 22-337-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Iron</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>3W</u>	Section(s): <u>SW 1/4, SW 1/4, Section 36</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Fe</u>
Latitude: <u>N 46° 18' 37"</u>	Primary Drainage: <u>Muskrat Creek</u>
Longitude: <u>W 111° 55' 43"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Muskrat Creek</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>August 9, 1994</u>
Inspectors: <u>Flammang, Belanger, West</u>	P.A. # <u>22-359</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 8,535 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Cobalt: 21.1 to 27.1 mg/kg                      Copper: 410 to 487 mg/kg  
Iron: 64,700 to 75,200 mg/kg
- One discharging adit was associated with the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for copper and the chronic aquatic life criteria for mercury were exceeded in the discharge.
- A sediment sample was collected from the adit discharge drainage (downstream from where the adit discharge seeped into the ground). The sediment contained significantly elevated (>3X background) levels of cobalt, copper, iron, and zinc.
- Potential safety hazards observed at the site included several collapsing loadout structures and several collapsing cabins.

Iron PA# 22-359  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 08/09/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-359-SE2	2.4	119	74.9	4.6	164	10.2	4130	115000	0.30	671	17.4	85.5	13.2 U	451	NR
22-359-WR1	0.6 U	47.6	34.8	4.0	27.1	2.8	487	64700	0.33	773	4.0	20.1	7.4 U	106	NR
22-359-WR2	2.5	64.0	80.0	3.5	21.1	6.0	410	75200	0.06	332	2.7	53.9	7.6 U	96.0	NR
BACKGROUND	2.0	95.9	105	3.2	5.0	10.5	60.0	13300	0.17	1020	6.8	90.7	12.0 U	110	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
22-359-WR1	0.04	1.25	8.81	7.56	0.04	0.04	<0.01	0.00	0.01	0.01	0.00	0.00	8.81	8.81
22-359-WR2	0.32	10.0	4.66	-5.3	0.24	0.24	0.03	0.94	0.05	0.05	0.03	3.75	3.75	3.75

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-359-AD1	0.12 UX	2.0	5.5 U	4.0 U	8.4 U	6.8 U	15.7	45.2	0.12	3.6	14.4 U	1.1 U	51.6 U	15.6 U	71.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-359-AD1	80	<5.0	10	0.09	NR

LEGEND

SE2 - Organic soil present above SE1 in dry drainage 200' below mine.

WR1 - Composite of subsamples WR1A, 2A, 2B, 5A, and 5B.

WR2 - Composite of subsamples WR2A, 4A, and 4B.

BACKGROUND - From the Iron Mine (22-359-SE1).

AD1 - Sample where water flows off road front, associated with WR4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Trumley Heap Leach</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>NW 1/4, SW 1/4, Section 15</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Millsite/Au</u>
Latitude: <u>N 46° 16' 13"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 58' 15"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Turnley Meadows Creek</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>July 1, 1994</u>
Inspectors: <u>Bisch, Flammang, West</u>	P.A. # <u>22-501</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The overall volume of tailings associated with this site could not be determined accurately. The site was previously reclaimed, and bore holes were not drilled through the reclaimed tailings to determine total depth. Although the reclamation effort appeared to have consisted of application of cover soil and revegetation, tailings were observed at the surface in several scattered, isolated pockets. The following elements were elevated to at least three times the background concentrations:

Silver: 55.2 mg/kg	Mercury: 2.83 mg/kg
Arsenic: 229 mg/kg	Lead: 3,710 mg/kg
Cadmium: 130 mg/kg	Antimony: 309J mg/kg
Copper: 367 mg/kg	Zinc: 12,100J mg/kg
- No waste rock was observed at the site.
- Turnley Creek flows adjacent to the site on the north side. No observed releases to Turnley Creek were documented; additionally, no MCLs or aquatic life criteria were exceeded in Turnley Creek either upstream or downstream from the site.
- Of the four monitoring wells located at the site, all were installed downgradient from the reclaimed tailings pond (no upgradient wells were found). The shallowest well was sampled (static water level = 8.15 feet from the top of the casing); and no MCLs were exceeded in the sample.

Trumley Heap Leach PA# 22-501  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER -  
INVESTIGATION DATE: 07/05/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-501-SE1	0.6 U	8.3	28.0	0.6 U	5.7	12.8	13.6	8610	0.03 U	180	6.4	8.1 U	6.5 U	37.7 J	NR
22-501-SE2	0.7 U	8.1	19.2	0.7 U	2.5	5.8	7.2	8780	0.03 U	137	3.5	9.2 U	7.4 U	13.7 J	NR
22-501-SS2	10.7	459	83.3	31.6	12.3	12.5	94.6	24500	0.59	868	10.7	863	47.6 J	2860 J	NR
22-501-SS3	4.1	29.9	181	10.0	8.9	25.8	51.7	18800	0.25	961	13.9	239	16.3 J	902 J	NR
22-501-TP1	55.2	229	17.5	130	3.4	2.4	367	9570	2.83	1920	3.2	3710	309 J	12100 J	NR
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	139	17400	0.05	1410	11.1	17.7	5.8 U	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %/1000	NEUTRAL POTENT %/1000	SULFUR ACID BASE POTENT %/1000	SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE %/1000	SULFUR ACID BASE POTENT %/1000
22-501-TP1	0.05	1.56	146	145	<0.01	0.09	0.03	0.94	145

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-501-GW1	0.12 U	1.1 U	50.9	2.6 U	11.1 JX	4.7 U	4.6 U	15.0	0.11 U	4.4 U	8.0 U	2.3	29.4 U	13.9	503
22-501-GW2	0.12 U	1.1 U	50.5	2.6 U	10.7 JX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	1.8	29.4 U	17.2	510
22-501-GW3	0.12 U	1.1 U	2.1 U	2.6 U	8.7 UX	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	0.4 U	29.4 U	4.5 U	<0.1
22-501-SW1	0.12 U	1.4	11.9	2.6 U	8.7 UX	4.7 U	4.6 U	410 J	0.11 U	29.1	8.0 U	1.0	29.4 U	5.1	57.1
22-501-SW2	0.12 U	1.5	8.7	2.6 U	8.7 UX	4.7 U	4.6 U	240 J	0.11 U	19.2	8.0 U	0.7	29.4 U	4.5 U	52.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-501-GW1	911	<5.0	532	1.72	0.01
22-501-GW2	997	<5.0	507	1.86	<0.005
22-501-GW3	NR	NR	NR	NR	<0.005
22-501-SW1	57	<5.0	10	0.07	0.01
22-501-SW2	80	<5.0	9.0	0.07	<0.005

LEGEND

- SE1 - Dissolved in Trumley Creek.  
SE2 - Uptaken in Trumley Creek.  
SS2 - 5 point composite on line 50' apart across quarry vegetated subunit area.  
SS3 - 5 point composite on line 50' apart below leaching, downgradient of subunit area.  
TP1 - Composite of subunit TP1 and UNIC-1.  
BACKGROUND - From the Trumley Heap Leach (22-501-SE1).
- GW1 - Center monitoring well, upstream of aquifer.  
GW2 - Duplicate of GW1.  
GW3 - Blank sample.  
SW1 - Same as sample 22-501-SE1.  
SW2 - Same as sample 22-501-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Elkhorn Creek Tailings</u>	County: <u>Jefferson</u>
Legal Description: <u>T 6N R 3W</u>	Section(s): <u>SE 1/4, E 1/2, Section 15</u>
Mining District: <u>Elkhorn</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 10' 11"</u>	Primary Drainage: <u>Elkhorn Creek</u>
Longitude: <u>W 111° 57' 18"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Elkhorn Creek</u>
Quad: <u>Elkhorn</u>	Date Investigated: <u>August 8, 1994</u>
Inspectors: <u>Tuesday, Belanger, West</u>	P.A. # <u>22-502</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 51,635 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 54.1 to 86.4 mg/kg	Mercury: 1.71 to 9.36 mg/kg
Arsenic: 189 to 448 mg/kg	Lead: 3,380 to 8,800 mg/kg
Cadmium: 134 to 229 mg/kg	Antimony: 256 to 484 mg/kg
Copper: 323 to 687 mg/kg	Zinc: 12,300 to 18,400 mg/kg
- No waste rock was observed at the site.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Elkhorn Creek flows through the center of the site. Observed releases to Elkhorn Creek were documented for lead and zinc. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included a collapsing mill building.

Elkhorn Creek Tailings PA# 22-502  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/08/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-502-SE1	54.8	164	22.2	89.8	3.5	4.4	332	10300	26.9	1380	6.1 J	3510	225	9440	NR
22-502-SE2	63.2	165	19.4	79.9	3.5	4.1	340	10200	40.2	1370	5.0 J	3590	226	9260	NR
22-502-SE3	93.0	159	37.7	38.1	8.5	8.0	409	28800	44.3	384	7.8 J	3190	209	11400	NR
22-502-TP1	86.4	320	24.0	180	2.9	4.0	601	11300	5.45	2580	6.7 J	5910	430	14800	8.18
22-502-TP2	74.5	448	32.2	229	4.1	4.9	687	14900	9.36	3200	10.3 J	8800	484	18400	10.8
22-502-TP3	54.1	189	10.0	134	3.2	2.9	323	7330	1.71	1690	3.3 J	3380	256	12300	1.91
BACKGROUND	0.5 U	21.3	267	0.5 U	9.3	15.0	13.9	17400	0.05	1410	11.1	17.7	5.8 U	85.8 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	%	%	%	%	%	POTENT.	1/1000	POTENT.	1/1000
22-502-TP1	0.15	4.69	198	193	0.01	0.08	0.06	0.06	0.01	0.01	0.00	0.00	198	2.50	200	204
22-502-TP2	0.35	10.9	200	190	0.35	<0.01	0.01	0.01	0.01	0.00	0.00	0.00	200	0.00	204	204
22-502-TP3	0.17	5.31	204	199	0.02	<0.01	0.21	0.21	0.00	0.00	0.00	0.00	204	0.00	204	204

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-502-SW1	0.22 JX	10.7	19.4	9.8	8.4 U	6.8 U	8.7	77.9 J	0.76	43.2 J	14.4 U	86.2 J	51.6 U	299	148
22-502-SW2	0.15 JX	9.2	15.6	6.6	8.4 U	6.8 U	9.5	108 J	0.36	34.4 J	14.4 U	66.4 J	51.6 U	181	141
22-502-SW3	0.32 JX	9.5	12.7	4.0 U	8.4 U	6.8 U	7.0	98.0 J	0.30	8.8 J	14.4 U	16.0 J	51.6 U	21.1	126

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-502-SW1	121	<5.0	19	0.19	NR
22-502-SW2	125	<5.0	12	0.09	NR
22-502-SW3	100	<5.0	6	<0.05	NR

LEGEND

- SE1 - Derivative of Elkhorn Creek; below TP2.  
SE2 - Midstream Elkhorn Creek; between TP1 and TP2.  
SE3 - Upstream Elkhorn Creek; above TP1.  
TP1 - Composite of subsamples TP1A.1 through 1A.4.  
TP2 - Composite of subsamples TP2A.1 through 2A.4.  
TP3 - Composite of subsamples TP3A.1 through 3A.4.  
BACKGROUND - From the Tuesday Heap Leach (22-501-881).
- SW1 - Same as sample 22-502-SE1.  
SW2 - Same as sample 22-502-SE2.  
SW3 - Same as sample 22-502-SE3.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Comet</u>	County: <u>Jefferson</u>
Legal Description: <u>T 7N R 5W</u>	Section(s): <u>S 1/2, Sec. 36</u>
Mining District: <u>Basin/High Ore</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 18' 37"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 10' 02"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>High Ore Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 8, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-009</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The past reclamation project involving stream diversion and settling pond construction was in need of repair and maintenance. The diversion ditch was at risk of failure and the upper settling pond was at full capacity and ineffective.
- The volume of tailings associated with this site was estimated to be approximately 500,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3400 to 4790 mg/kg	Cadmium: 13.0 to 20.1 mg/kg
Copper: 324J to 445J mg/kg	Iron: 33,900 to 39,700 mg/kg
Mercury: 0.338 to 0.975 mg/kg	Lead: 2330 to 4420 mg/kg
Antimony: 14 to 31 mg/kg	Zinc: 1900J to 3020J mg/kg
Manganese: 5860 to 8550 mg/kg	
- The lower tailings impoundment (TP2) was breached and actively eroding.
- The volume of waste rock associated with this site was estimated to be approximately 214,000 cubic yards. The following elements are elevated at least three times background:

Arsenic: 1260 to 1610 mg/kg	Cadmium: 23.6 to 36.4 mg/kg
Copper: 245J to 248J mg/kg	Manganese: 3930 to 6100 mg/kg
Mercury: 0.543 to 1.59 mg/kg	Lead: 2590 to 3750 mg/kg
Antimony: 25 mg/kg	Zinc: 3720J to 6060J mg/kg
- High Ore Creek had been diverted around most of the site, although diversion leakage, groundwater discharge, and runoff was still transporting contaminants to the creek. Observed releases to High Ore Creek were documented for arsenic, cadmium, copper, manganese, lead, and zinc; and MCLs for arsenic and cadmium were exceeded in the downstream sample. The acute aquatic life criteria was exceeded for zinc and the chronic aquatic life criteria for copper and zinc were exceeded; directly attributable to the site. Water pH in the stream remains above neutral as the stream flows through the impacted area.

Comet Tailings PA# 22-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/08/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-009-SE-1	1670	150	19.3	17.4	4.7	224 J	18300	0.330	6080	4 J	1560	16	3670 J	NR
22-009-SE-2	25	120	1.2	5.3	8.7	7.8 J	11300	0.025	992	6 J	33	8 U	62 J	NR
22-009-TP-1	4790	224	17.7	16.1	1.8	324 J	39700	0.338	5860	6 J	1530	14	3010 J	NR
22-009-TP-2	4840	205	13.0	10.8	3.3	434 J	33900	0.975	7440	3 J	2610	26	1900 J	NR
22-009-TP-3	3400	239	20.1	12.6	3.3	445 J	32500	0.674	8550	2 U	2270	31	3020 J	NR
22-009-WR-1	1610	153	36.4	8.1	1.6	248 J	24500	1.59	3930	4 J	3750	13	6060 J	NR
22-009-WR-2	1260	65.0	23.6	5.0	1.5	245 J	23100	0.543	6100	3 U	2590	25	3720 J	NR
BACKGROUND	137	265	3.0	6.7	4.6	35.9 J	12100	0.019	1280	6 J	84	7 U	227 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE %	SULFUR ACID BASE POTENT. %
22-009-SS-1DUP	0.02	0.62	7.23	6.61	<0.01	0.01	0.01	0.31	6.92
22-009-SS-1	0.02	0.62	7.41	6.78	0.01	0.01	0.01	0	7.41
22-009-TP-1	2.96	92.5	146	53.8	<0.01	0.38	0.38	108	37.9
22-009-TP-2	1.92	60	79.7	19.7	0.4	1.34	0.18	14.9	37.8
22-009-TP-3	1.94	57.5	104	46.6	0.63	0.99	0.22	30.9	73.2
22-009-WR-1	1.18	36.9	41.1	4.22	0.57	0.37	0.24	11.6	29.5
22-009-WR-2	1.6	50	45.3	4.7	0.39	0.52	0.69	16.2	29.1

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
22-009-GW-1	13.4 J	44.4	7.87	9.7 U	6.83 U	57 J	39.9	0.038 U	455	12.7 U	6.51 J	30.7 U	1870	286
22-009-GW-2	11 J	45.5	8.37	9.7 U	6.83 U	63.2 J	22.4	0.130 J	440	12.7 U	6.37 J	30.7 U	2110	288
22-009-SW-1	56.7 J	27	7.03	9.7 U	6.83 U	20.8 J	429	0.042 J	1240	12.7 U	25.3 J	30.7 U	2020	129
22-009-SW-2	4.19 J	29.5	2.57 U	9.7 U	6.83 U	1.55 U	209	0.038 U	43.7	12.7 U	7.69 J	30.7 U	7.57 U	54.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND

- SE1 - Downgradient approx. 0.25 mile from the end of reclaimed stream.  
SE2 - Upgradient approx. 300 feet above town.  
TP1 - Composite of subsamples TP1A-A, -B, -C.  
TP2 - Composite of subsamples TP2A-A, -B, -C, and -D.  
TP3 - Composite of subsamples TP3A-A, -B, -C, -D, -E, and TP1C-A, -B, -C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 1D, 1E, 2A, 2B, and 2C.  
WR2 - Composite of subsamples WR2A, 3B, 3C, and 3D.  
BACKGROUND - From the Comet Mine (22-009-SS-1).
- SSI - Background sample.  
GW1 - Silver Hill shaft #1.  
GW2 - Duplicate of sample 22-009-GW-1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Grey Eagle</u>	County: <u>Jefferson</u>
Legal Description: T <u>7N</u> R <u>5W</u>	Section(s): <u>SW 1/4, Sec. 35</u>
Mining District: <u>Basin/High Ore</u>	Mine Type: <u>Hardrock/Ag, Pb, Cu, Zn, Au</u>
Latitude: <u>N 46° 18' 52"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 112° 12' 00"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Bishop Creek</u>
Quad: <u>Mount Thompson</u>	Date Investigated: <u>July 9, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>22-029</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 73,000 cubic yards. The following elements were elevated at least three times background:

Copper: 503 mg/kg	Mercury: 0.411J mg/kg
Lead: 722 mg/kg	Zinc: 859 mg/kg
- Iron staining emanating from Adit #1 indicated past discharge, although no discharge was occurring at the time of the investigation. The water collected within the adit portal had a pH of 6.98 and a specific conductance of 354 umhos/cm.
- Bishop Creek, a tributary to High Ore Creek, flowed adjacent to the site. Observed releases to Bishop Creek (sediment) were documented for copper, lead, and zinc. No MCLs/MCLGs or aquatic life criteria were exceeded that were directly attributable to the site.

Grey Eagle PA# 22-029  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-029-SE-1	63 JX	62.9	1.4	4.4	5.9	43.3	9470	0.013 J	817 J	4	266	12 J	361	NR
22-029-SE-2	7 JX	57.3	0.6 U	4.1	7.5	7.1	10500	0.01 U	557 J	5	14	8 UJ	32	NR
22-029-WR-1	265 JX	491	4.1	7.4	1.1 U	503	13900	0.411 J	1840 J	6	722	14 J	859	NR
BACKGROUND	137	265	3.0	6.7	4.6	35.9J	12100	0.019	1280	6J	84	7 U	227 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			NEUTRAL. ACID BASE			SULFUR ACID BASE			PYRITIC SULFUR			ORGANIC SULFUR			PYRITIC SULFUR			SULFUR ACID BASE		
	%	1/1000x	POTENT.	%	1/1000x	POTENT.	%	1/1000x	POTENT.	%	1/1000x	POTENT.	%	1/1000x	POTENT.	%	1/1000x	POTENT.	%	1/1000x	POTENT.
22-029-WR-1	1.74	54.4	84.2	29.8	0.51	0.72	0.51	0.51	0.72	0.51	0.72	0.51	0.51	0.72	0.51	0.51	0.72	0.51	0.51	0.72	61.7

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-029-SW-1	2.31	22.6	2.57 U	9.7 U	6.83 U	4.23 J	187 J	0.038 U	29.6 JX	12.7 U	9.68 JX	30.7 U	26.8 J	46.4
22-029-SW-2	1.69 U	21.9	2.57 U	9.7 U	6.83 U	2.9 J	159 J	0.038 U	16.6 JX	12.7 U	5.77 JX	30.7 U	13.3 J	32.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-029-SW-1	129	< 5.0	17	< 0.05	NR
22-029-SW-2	97	< 5.0	8	< 0.05	NR

LEGEND

SE1 - Downgradient of waste rock dumps on Bishop Creek.  
SE2 - Upgradient of waste rock dumps on Bishop Creek.  
WR1 - Composite of subsamples WR1A through 1D.  
BACKGROUND - From the Comet Tailings (22-009-SS-1).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

<p>Mine/Site Name: <u>Block "P" Mine</u> Legal Description: <u>T 15N R 9E</u> Mining District: <u>Hughesville</u> Latitude: <u>N 47° 05' 01"</u> Longitude: <u>W 110° 37' 56"</u> Land Status: <u>Private/Public</u> Quad: <u>Barker</u> Inspectors: <u>Bullock, Babits, Flammang, Lasher, Clark / Pierson</u> Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u></p>	<p>County: <u>Judith Basin</u> Section(s): <u>NE 1/4, NW 1/4 Sec. 7</u> Mine Type: <u>Hardrock/Pb, Ag, Zn</u> Primary Drainage: <u>Dry Fork Belt Creek</u> USGS Code: <u>10030105</u> Secondary Drainage: <u>Galena Creek</u> Date Investigated: <u>June 7, 1993</u> P.A. # <u>23-001</u></p>
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- There were no mill tailings associated with this site.
  
- The total volume of waste rock associated with this site was estimated at 125,000 cubic yards. The following elements were elevated at least three times background in previous investigations:

Arsenic: 299 to 1,030 mg/kg	Copper: 32 to 312 mg/kg
Mercury: 0.20 to 1.40 mg/kg	Lead: 4,050 to 24,600 mg/kg
  
- The waste rock was not contained, and was actively eroding into Galena Creek. The waste rock had a very low pH (2.52), was unvegetated, and had very steep sides along Galena Creek.
  
- One adit was on site; previous investigations estimated flow at 6 gpm, pH was 6.49, and SC was 375 us/cm. One seep was also associated with this site; flow estimated at 1.5 gpm, pH was 3.45, and SC was 1010 us/cm.
  
- Surface water samples were collected during the 1993 investigation. Observed releases to surface water were documented for arsenic in water, and arsenic, mercury, and lead in sediment samples. Drinking water standards (MCL's) were exceeded for cadmium, lead, and antimony; acute aquatic life criteria exceedances for cadmium, copper, and zinc were also documented. Upstream samples exceeded MCL's for antimony and lead, and acute aquatic life criteria for copper and zinc; the Hughesville mining district was upstream from the site and contributed to the observed upstream water quality degradation.
  
- Monitoring wells, sampled previously, indicated that MCL's were exceeded for cadmium, copper, nickel, and lead. These samples also documented an observed release to groundwater for copper and lead. The upgradient well exceeded MCL's for arsenic, cadmium, and nickel, indicating an upgradient source of contaminants.
  
- There was one open shaft, one open adit and at least five hazardous structures at the site.

Block P. Mine PA# 23-001  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-090-SE-8	255	218	3 J	9 J	4.8	215 J	43700	0.161 J	2120 J	19 J	3390	5 U	749 J	NR
07-090-SE-9	43	222	2.6 J	9.4 J	3.6	243 J	21400	0.057 J	2600 J	24 J	432	5 U	632 J	NR
07-090-SE-10	28	88.8	0.6 U	4.4 J	1.8	140 J	13400	0.03 J	653 J	9 J	82	4 U	180 J	NR
07-090-SE-11	101	608	33.3 J	13.8 J	8.5	1450 J	50200	0.178 J	10100 J	78 J	6800	15	7000 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
07-090-SW-8	29	23.6	30.2	5.99 U	5 U	239	11800	0.038 U	7560	41.5	51.1	38.9	7090	137
07-090-SW-9	0.98 U	25.1	2.55 U	5.99 U	5.6	150	1370	0.038 U	558	8.78 U	37.6	32.1	585	107
07-090-SW-10	2.09	20	2.55 U	5.99 U	5.13	6.77	403	0.038 U	77.4	8.78 U	2.52	33	54.3	85.5
07-090-SW-11	0.98 U	26.5	3.9	5.99 U	5 U	234	1950	0.038 U	840	8.78 U	64	32.9	861	115

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-090-SW-8	274	< 5.0	178	< 0.06	NR
07-090-SW-9	182	< 5.0	86	< 0.07	NR
07-090-SW-10	130	< 5.0	35	< 0.05	NR
07-090-SW-11	218	< 5.0	113	< 0.05	NR

LEGEND

SE8 - Upstream of Belt Patent Mine, downstream of Block P. Mine.  
SE9 - Galena Creek above Block P. Mine, approx. 20' above old weir.  
SE10 - Green Creek before confluence with Galena Creek approx. 610'.  
SE11 - Daisy Creek before confluence with Green Creek.  
SW8 - Same as sample SE8.  
SW9 - Same as sample SE9.  
SE10 - Same as sample SE10.  
SE11 - Same as sample SE11.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Marcelline</u>	County: <u>Judith Basin</u>
Legal Description: <u>T 15N R 9E</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 47° 04' 47"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 04"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 4, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>23-022</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings on site.
- There were approximately 700 cubic yards of waste rock on site. The following elements were elevated at least three times background:  
Copper: 196 mg/kg  
Mercury: 0.464 to 0.87 mg/kg  
Lead: 12,000 mg/kg
- There were no discharging adits on site. There was one filled shaft on site was discharging approximately 4 gpm with a pH 3.08 and a specific conductance of 2190 umhos/cm. Cadmium, nickel, and antimony exceeded MCL/MCLGs. Acute aquatic life criteria were exceeded for cadmium, copper, and zinc. The chronic aquatic life criteria were exceeded for cadmium, copper, iron mercury, lead, nickel, and zinc.
- An adit discharge from the Danny T Mine, up-slope from this site, flowed through Waste Rock #4 prior to discharging into Galena Creek. This discharge exceeded the MCL/MCLGs for arsenic, cadmium, copper, nickel, and antimony. This discharge also exceeded the acute and chronic aquatic life criteria for arsenic, cadmium, copper, and zinc, as well as the chronic aquatic life criteria for iron, lead, and nickel.
- There were no observed releases documented on Galena Creek from the water samples (the creek has upgradient sources). Galena creek exceeded cadmium and antimony MCL/MCLGs both upstream and downstream from this site. The acute aquatic life criteria for cadmium, copper and zinc as well as the chronic aquatic life criteria for cadmium, copper, iron, lead, and zinc were exceeded in both the upstream and downstream Galena Creek samples. Therefore, these exceedances are not directly attributed to this site.
- There were two open adits and one partially open shaft (six feet) on site that were classified as hazardous mine openings.

**Marcelline PA# 23-022**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/04/93**

**SOLID MATRIX ANALYSES**

**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-022-WR-2	122	208 J	1.5 J	2.07 J	1.41 J	31.1	23600	0.464	62.2	3.93	938	3.98 UJ	125	NR
23-022-WR-4	334	245 J	14.4 J	1.55 J	2.18 J	196	29700	0.87	145	2.76	12000	10 J	2170	NR
07-090-SE-5	368	213	0.7 U	6.7 J	4.7	146 J	56400	0.214 J	975 J	9 J	1410	5 U	566 J	NR
23-046-SE-6	379	220	2.3 J	11.9 J	7.3	139 J	68400	0.275 J	1800 J	11 J	4040	5 U	562 J	NR
07-090-SE-7	154	59	0.8 J	3.6 J	3.7	106 J	25200	0.177 J	438 J	3 J	584	4 U	152 J	NR
BACKGROUND	122 J	441 J	5.0	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Reported

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000
23-022-WR-2	1.75	54.7	-0.8	-4.4	-56	-36	1.71	0.94	< 0.01	0.04	0.12	0.94	0	-0.83	-5.3	
23-022-WR-4	1.09	34.1	-4.4						0.03							

**WATER MATRIX ANALYSES**

**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	CALC.
23-022-GW-1	15.1	2.24 U	365	106	5 U	277	51000	0.066 J	183000	981	502	100	79500	781
23-022-GW-2	14.7	2.24 U	369	111	5 U	264	52800	0.051 J	186000	999	539	96	81000	791
23-022-SW-1	1800	2.24 U	512	98.2	14.8	2730	248000	0.1 J	183000	969	137	126	108000	471
23-022-SW-2	1840	5.43	513	86.7	13.3	2950	291000	0.079 J	184000	965	216	125	108000	487
07-090-SW-5	38.7	23	34.4	8.73	5 U	256	12600	0.038 U	8940	45.9	59.6	50	7980	135
23-046-SW-6	13.9	20.6	13.2	5.99 U	5 U	57.8	5150	0.087	869	10.9	14.5	18.3 U	2130	76.9
07-090-SW-7	33	23.7	34.7	6.77	5 U	265	12300	0.038 U	8090	39.4	68.6	50.8	7790	142

**Wet Chemistry Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-022-GW-1	2220	< 5.0	1370	0.1	NR
23-022-GW-2	2190	< 5.0	1360	< 0.05	NR
23-022-SW-1	2700	< 5.0	1610	< 0.05	NR
23-022-SW-2	2800	< 5.0	1620	< 0.05	NR
07-090-SW-5	308	< 5.0	182	< 0.06	NR
23-046-SW-6	141	< 5.0	60	< 0.05	NR
07-090-SW-7	320	< 5.0	185	0.07	NR

WR2 - Composite of subsamples WR2A, 2B, 2C, 3A, 3B, and 3C.

WR4 - Composite of subsamples WR4A and 4B.

BACKGROUND - From the Bon Ton Mine (07-094-SS-1).

07-090-SE5 - Galena Creek downstream from the site

23-046-SE6 - Unnamed Trib. from Wright/Edwards at confluence with Galena Ck.

07-090-SE7 - Galena Creek upstream from the site.

GW1 - From the Marcelline Shaft.

GW2 - Duplicate of 23-022-GW-1.

SW1 - Eastern Tributary drainage @ confluence with Galena Creek.

SW2 - Eastern tributary drainage as it enters Marcelline property @ toe of the upgradient mine dump.

07-090-SW5 - Same as 07-090-SE5

23-046-SW5 - Same as 23-046-SE6

07-090-SW7 - Same as 07-090-SE7



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Belt Patent</u>	County: <u>Judith Basin</u>
Legal Description: T <u>15N</u> R <u>9E</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Au, Pb, Zn</u>
Latitude: <u>N 47° 04' 47"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 00"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 4, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>23-035</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 750 cubic yards. The tailings are actively eroding into Galena Creek. The following elements were elevated at least three times background in the samples collected:

Arsenic: 929 to 3520 mg/kg	Cadmium: 33.9J to 50.4J mg/kg
Copper: 250 to 384 mg/kg	Mercury: 1.4 to 2.1 mg/kg
Lead: 9570 to 17,100 mg/kg	Antimony: 17.4J to 33.5J mg/kg
Zinc: 5440 to 7830 mg/kg	
- The volume of waste rock associated with this site was estimated to be approximately 65 cubic yards. No samples of the dump were collected for laboratory analysis; however, XRF measurements were taken.
- There were no adit discharges, seeps or springs observed at the site at the time of the investigation.
- Galena Creek flowed adjacent to the site on the west side. No observed release to surface water were attributed to the site. Contaminant concentrations measured in the upstream surface water sample were nearly identical to the concentrations measured in the downstream samples. MCLs were exceeded for cadmium and antimony both upstream and downstream of the site. Additionally, the chronic aquatic life criteria for iron, mercury, cadmium, copper, lead and zinc, and the acute aquatic life criteria for cadmium, copper, and zinc were exceeded both upstream and downstream from the site. The upgradient surface water sample indicated the presence of an upgradient contaminant source.

**Belt/Grace/Marcelline PA# 23-035**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/04/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-090-SE-7	154	59	0.8 J	3.6 J	3.7	106 J	25200	0.177 J	438 J	3 J	584	4 U	152 J	NR
07-090-SE-8	255	218	3 J	9 J	4.8	215 J	43700	0.161 J	2120 J	19 J	3390	5 U	749 J	NR
23-035-TP-1A	929	1100 J	33.9 J	1.26 U	1.47 J	384	31200	2.1	77.6	1.85 U	17100	33.5 J	5440	1.128 U
23-035-TP-1B	3520	884 J	50.4 J	1.39 J	0.98 U	250	76000	1.3	31	1.72 U	9570	17.4 J	7830	1.107 U
BACKGROUND	122 J	441 J	5.0	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	POTENT.	SULFUR	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.
	%	U/1000	U/1000	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
23-035-TP1A	1.91	59.7	-4.3	-64	1.01	-64	0.22	6.87	0.69	-11.1	0.038 U	0.038 U	8090	-11.1
23-035-TP1B	2.84	88.7	-10	-89	0.4	-89	0.76	23.7	1.68	-34	0.038 U	0.038 U	7560	-34

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
07-090-SW-7	33	23.7	34.7	6.77	5 U	265	12300	0.038 U	8090	39.4	68.6	50.8	7790	142
07-090-SW-8	29	23.6	30.2	5.99 U	5 U	239	11800	0.038 U	7560	41.5	51.1	38.9	7090	137

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-090-SW-7	320	< 5.0	185	0.07	NR
07-090-SW-8	274	< 5.0	178	0.06	NR

**LEGEND**

SE7 - Downstream in Galena Creek  
 SE8 - Upstream in Galena Creek  
 TP1A - Composite of subsamples TP1A and 2A.  
 TP1B - Sample of the TP1B subsample.  
 BACKGROUND - From the Bon Ton Mine (07-094-SS-1).  
 SW7 - Same as sample SE7.  
 SW8 - Same as sample SE8.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>NE SE S7 (Lucky Strike)</u>	County: <u>Judith Basin</u>
Legal Description: <u>T 15N R 9E</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 47° 04' 28"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 00"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 4, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>23-042</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 5,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 272 to 368 mg/kg  
Copper: 85.6 to 146J mg/kg  
Mercury: 0.214 to 0.458 mg/kg
- A minor discharge from the on site adit was observed at the time of the investigation. No MCLs/MCLGs or Montana Numeric Water Quality Standards were exceeded in the adit discharge. The discharge combined with an unnamed tributary which flowed over and through WR-1 and then discharged to Galena Creek. A second surface water sample was collected from the discharge after flowing through the waste rock dump. There were no MCL exceedances; however, acute aquatic life criteria were exceeded for cadmium, copper, and zinc, and chronic aquatic life criteria were exceeded for copper, lead, and zinc.
- Surface water samples were collected upstream and downstream from the site in Galena Creek. MCLs were exceeded for cadmium and antimony in both the upstream and downstream samples. Chronic aquatic life criteria for iron, cadmium, copper, lead, and zinc were exceeded in the both the upstream and downstream samples. Acute aquatic life criteria were exceeded for cadmium, copper, lead and zinc in both the upstream and downstream samples; additionally, acute aquatic life criteria for cadmium was exceeded in the upstream sample.
- There was little stream bank vegetation observed, and predominant iron oxide staining was evident during the investigation.
- There was a shaft observed above the adit which had caved and poses a safety hazard.

NE SE Sec. 7 (Lucky Strike) PA# 23-042  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/04/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-090-SE-4	272	147	3.6 J	3.2 J	5.1	107 J	45900	0.097 J	651 J	6 J	1590	4 U	811 J	NR
07-090-SE-5	368	213	0.7 U	6.7 J	4.7	146 J	56400	0.214 J	975 J	9 J	1410	5 U	566 J	NR
23-042-WR-1	283	195 J	1.1 J	1.15 U	0.96 U	85.6	32400	0.458	180	2.75	971	3.5 UJ	135	NR
BACKGROUND	122 J	441 J	5	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
23-042-WR1	0.63	19.7	-3.5	-23	0.06	< 0.01	0	-3.53

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-042-SW-1	3.24	18	2.55 U	5.99 U	5 U	5.2	512	0.086 J	5220	37.8	2.53	18.3 U	403	164
23-042-SW-2	2.95	46.8	2.55 U	6.4	5 U	19.2	635	0.054 J	2730	23.6	2.91	18.3 U	208	59.3
07-090-SW-4	38.8	22.7	36.5	9.03	5 U	246	11600	0.038 U	8670	43.4	121	53.8	7750	131
07-090-SW-5	38.7	23	34.4	8.73	5 U	256	12600	0.038 U	8940	45.9	59.6	50	7980	135

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-042-SW-1	279	< 5.0	177	< 0.05	NR
23-042-SW-2	115	< 5.0	70	0.05	NR
07-090-SW-4	318	< 5.0	181	0.05	NR
07-090-SW-5	308	< 5.0	182	0.06	NR

LEGEND

- SE4 - Downgradient Galena Creek.  
SE5 - Upgradient Galena Creek.  
WR1 - Composite of subsamples WR1 and 2A through 2C.  
BACKGROUND - From Silver Dyke Adit (07-135-SS-1).
- SW1 - Adit discharge.  
SW2 - Discharge from bottom of dump.  
SW4 - Same as sample SE4.  
SW5 - Same as sample SE5.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Wright Lode</u>	County: <u>Judith Basin</u>
Legal Description: T <u>15N</u> R <u>9E</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Pb, Ag, Zn</u>
Latitude: <u>N 47° 05' 03"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 23"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>June 7, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>23-045</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 19,900 cubic yards. The following elements were elevated at least three times background:

Arsenic: 280 to 316 mg/kg	Mercury: 0.427J to 0.649J mg/kg
Cadmium: 3.4J mg/kg	Lead: 8,430 to 14,200 mg/kg
Copper: 83.6J to 246J mg/kg	Zinc: 393J to 640J mg/kg
- There were no mine opening discharges, seeps or springs identified at this site.
- A storm runoff event was occurring during the investigation. An unnamed tributary to Galena Creek flowed directly through the site (over and through WR-3 and WR-4). The MCL/MCLG for antimony was exceeded in both upstream and downstream surface water samples collected from the tributary. Observed releases to surface water were documented for arsenic, cadmium, copper, mercury, lead, and zinc. MCL/MCLGs for arsenic and cadmium were exceeded in the downstream sample and were directly attributable to the site. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, and lead in the downstream sample, and chronic aquatic life criteria were exceeded for iron, mercury, and copper in the downstream sample. The acute and chronic aquatic life criteria exceedances for arsenic, cadmium, and lead and the chronic aquatic life criteria exceedances for mercury and copper were directly attributable to the site.
- Several potentially hazardous pits and trenches were scattered throughout the area, ranging to 10 feet deep. Several of the waste rock dumps had very steep and unstable banks.

**Wright Lode PA# 23-045**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 06/07/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-045-WR-2	280	183	3.4 J	1.2 U	2.1	246 J	21400	0.427 J	16.7 J	2 U	8430	4 U	640 J	NR
23-045-WR-4	316	170	1.7 J	1.2 U	1.2	83.6 J	17900	0.649 J	22.6 J	3 J	14200	11	393 J	NR
BACKGROUND	29	270	0.6 U	3.1 J	7	11.6 J	11100	0.053 J	359 J	5 J	241	5 U	28 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
23-045-WR-2	1.42	44.4	-4.8	-3.3	-49	-53	1.24	1.55	0.02	<0.01	0.16	0.05	0.62	0	-5.44	-3.33
23-045-WR-4	1.6	50														

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-045-SW-1	888	182	79	14.4	5.2	624	79300	1.02	4560	29.8	12700	64.7	14500	47.9
23-045-SW-2	0.98 U	44.1	2.55 U	5.99 U	5 U	1.35 U	26.7	0.038 U	2.6 U	8.78 U	0.48	27.9	75.2	8.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-045-SW-1	486	< 5.0	229	< 0.05	NR
23-045-SW-2	106	< 5.0	11	< 0.05	NR

**LEGEND**

WR2 - Composite of subsamples WR2A, 2B, and 3.  
 WR4 - Composite of subsamples WR4A, 4B, 4D, and 4E.  
 BACKGROUND - From the Wright Lode (23-045-SS-1).

SW1 - At base of waste rock dump 4.  
 SW2 - Above waste rock dump 3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Edwards</u>	County: <u>Judith Basin</u>
Legal Description: <u>T 15N R 9E</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 47° 04' 55"</u>	Primary Drainage: <u>Galena Creek</u>
Longitude: <u>W 110° 38' 16"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Unnamed tributary to</u>
Quad: <u>Barker</u>	<u>Galena Creek</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	Date Investigated: <u>June 7, 1993</u>
Organization: <u>Pioneer Technical Services, Inc/ Thomas, Dean &amp; Hoskins, Inc.</u>	P.A. # <u>23-046</u>

- There are no tailings on site.
- There are approximately 50,750 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 649 mg/kg	Cadmium: 3.3J mg/kg
Copper: 499J mg/kg	Mercury: 1.87J mg/kg
Lead: 24,900 mg/kg	Antimony: 19 mg/kg
Zinc: 827J mg/kg	
- There were no discharging adits on site.
- The creek ran through waste rock. There were no observed releases to downstream surface water (there was an upgradient contaminant source). Arsenic and antimony exceeded MCLs in downstream surface water which were directly attributable to the site. The acute and chronic aquatic life criteria was exceeded for arsenic, copper, lead, and zinc in downstream surface water. The chronic aquatic life criteria was exceeded for iron in downstream surface water.
- There was one open adit on site.

**Edwards PA# 23-046**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 06/07/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Cyanide (mg/Kg)
23-046-SE-2	526	182	3.5 J	1.4 U	1.4	68.4 J	19700	0.187 J	131 J	2 U	4740	4	645 J	NR
23-046-SE-6	379	220	2.3 J	11.9 J	7.3	139 J	66400	0.275 J	1800 J	11 J	4040	5 U	562 J	NR
23-046-WR-2	649	170	3.3 J	1.6 U	2.2	499 J	28400	1.87 J	10.9 J	4 J	24900	19	827 J	NR
BACKGROUND	29	270 J	0.6 U	3.1 J	7	11.6 J	11100	0.053 J	359 J	5 J	241	5 U	28 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
23-045-SW-1	886	182	79	14.4	5.2	624	79300	1.02	4560	29.8	12700	64.7	14500	47.9
23-046-SW-2	1020	164	106	15.5	8.13	812	105000	1.05	6640	49.1	12800	48	19400	73.3
23-046-SW-6	13.9	20.6	13.2	5.99 U	5 U	57.8	5150	0.087	869	10.9	14.5	18.3 U	2130	76.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision

**Wet Chemistry**

**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-045-SW-1	486	< 5.0	229	< 0.05	NR
23-046-SW-2	730	< 5.0	381	< 0.05	NR
23-046-SW-6	141	< 5.0	60	< 0.05	NR

**LEGEND**

SE2 - Below waste rock dump 1 in tributary.  
 SE6 - Unnamed tributary just prior to confluence with Galena Creek.  
 WR2 - Composite of subsamples WR2A, 2B, 2C, 2D, and 2E.  
 BACKGROUND - From the Wright Lode Mine (23-045-SR-1).  
 SW1 - At base of waste rock dump 4 from 23-045 site.  
 Upgradient sample of the Edwards Mine.  
 SW2 - Same as sample SE2.  
 SW6 - Same as sample SE6.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Harrison</u>	County: <u>Judith Basin</u>
Legal Description: T <u>15N</u> R <u>9E</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 6</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 47° 05' 24"</u>	Primary Drainage: <u>Galena Creek and Dry</u>
Longitude: <u>W 110° 37' 22"</u>	<u>Fork Belt Creek</u>
Land Status: <u>Private/Public</u>	USGS Code: <u>10030105</u>
Quad: <u>Mixes Baldy</u>	Secondary Drainage: <u>Daisy Creek</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	Date Investigated: <u>June 3, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>23-056</u>

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 10,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 182J mg/kg	Iron: 90,300 mg/kg
Barium: 670J mg/kg	Mercury: 0.75 mg/kg
Cadmium: 9 mg/kg	Manganese: 12,800 mg/kg
Copper: 1,270J mg/kg	Nickel: 68.5 mg/kg
Lead: 10,600 mg/kg	Zinc: 390 mg/kg
- One discharging adit was observed at the site during the investigation. The adit was discharging at 0.25 cfs, with a pH of 6.10 and a specific conductance of 680 umhos/cm. The MCL for cadmium was exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for copper and zinc in the adit discharge, and chronic aquatic life criteria were exceeded for cadmium and lead.
- The surface water samples collected on Daisy Creek did not document an observed release to surface water attributable to this site. The MCL/MCLG for cadmium was exceeded in surface water samples collected both upstream and downstream of the site in Daisy Creek. Acute and chronic aquatic life criteria were exceeded for copper, lead, and zinc, and chronic aquatic life criteria were exceeded for iron and cadmium, in both upstream and downstream samples. The acute and chronic aquatic life criteria for cadmium, and the chronic aquatic life criteria for mercury were exceeded in the upstream sample on Daisy Creek. Observed releases to Daisy Creek were documented in the stream sediment samples collected for arsenic, copper, iron, mercury, and lead; although, the data indicated likely additional upstream contaminant sources.
- One potentially hazardous collapsing cabin was observed at the site, and several of the waste rock dumps were very steep and unstable.

Harrison/Moulton PA# 23-056  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-056-SE-1	306 J	1720 J	12.2	4.03	5.2 J	2590 J	151000	1.1	8610	47.2	13400	14 J	3590	NR
23-056-SE-2	58.6 J	825 J	4.3	5.91	7.46 J	374 J	44000	0.106	4820	35.1	4360	4.24 UJ	2120	NR
23-056-WR-1	182 J	670 J	9.0	3.2	6.24 J	1270 J	90300	0.75	12800	68.5	10600	6.43 J	2330	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.028	548	7.93	61.4	3.98 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE U/1000x	NEUTRAL POTENT. U/1000x	POTENT. U/1000x	SULFUR %	SULFUR %	SULFUR %	ACID BASE U/1000x	SULFUR %	SULFUR %	SULFUR U/1000x	ACID BASE U/1000x	POTENT. U/1000x	
23-056-WR-1	4.26	133	66.4	-67	1.53	1.08	1.65	33.7					32.6	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
23-056-GW-1	0.98 U	19.8	11.4	5.99 U	5 U	516 J	704	0.038 U	2970	23.9	26.8	18.3 U	2470 JX	355
23-056-SW-1	1.37	32.5	6.37	5.99 U	5 U	325 J	4760	0.038 U	1990	21.9	312	18.3 U	2060 JX	214
23-056-SW-2	0.98 U	19.9	8.3	5.99 U	5 U	133 J	4530	0.043	1600	19.9	369	18.3 U	2340 JX	127

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-056-GW-1	495	< 5.0	217	0.11	NR
23-056-SW-1	307	< 5.0	178	0.11	NR
23-056-SW-2	200	< 5.0	129	0.16	NR

LEGEND

SE1 - Downstream of dumps and confluence of acid discharge.  
SE2 - Upstream of possible influences from dumps.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.  
BACKGROUND - From the Tiger Mine (23-059-SS-1).  
GW1 - Adit discharge.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Moulton</u>	County: <u>Judith Basin</u>
Legal Description: T <u>15N</u> R <u>9E</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 5</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn, Au</u>
Latitude: <u>N 47° 05' 27"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 36' 58"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Daisy Creek</u>
Quad: <u>Mixes Baldy</u>	Date Investigated: <u>June 3, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>23-058</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 975 cubic yards. The following elements were elevated at least three times background:

Arsenic: 57.2J mg/kg	Mercury: 0.261 mg/kg
Barium: 794J mg/kg	Manganese: 8,360 mg/kg
Cadmium: 5 mg/kg	Nickel: 52.7 mg/kg
Copper: 618J mg/kg	Lead: 22,400 mg/kg
Iron: 65,300 mg/kg	Zinc: 1,540 mg/kg
- One adit discharge was associated with this site, which flowed across the dump into intermittent Daisy Creek. The adit discharge exceeded the MCL for cadmium. Acute aquatic life criteria were exceeded for cadmium, copper, lead, and zinc. Chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, iron, mercury, copper, lead, and zinc. The adit discharge pH measurement was 4.11 and specific conductance was 1,220 umhos/cm.
- No observed releases to surface water were documented for this site; although, waste rock was observed in the stream channel and vegetation was lacking along the stream bank for more than 50 feet downstream from the adit confluence. The downstream sample in Daisy Creek exceeded the MCL for cadmium; however, the upstream sample in Daisy Creek also exceeded the MCL for cadmium, indicating the presence of an upgradient contaminant source (Tiger Mine). Several acute and chronic aquatic life criteria were exceeded in both the upstream and downstream samples in Daisy Creek.

**Moulton PA# 23-058**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/03/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-058-SE-1	89 J	617 J	5.8	5.29	18 J	299 J	108000	0.146	2370	21.5	8670	8.19 J	2440	NR
23-058-SE-2	47.1 J	871 J	2.6	1.45 U	4.69 J	241 J	52300	0.302	674	8.7	6620	4.88 J	1200	NR
23-058-WR-1	57.2 J	794 J	4.7	5.63	8.79 J	618 J	65300	0.261	8360	52.7	22400	8.85 J	1540	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.028	548	7.93	61.4	3.98 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
23-058-WR1	2.89	90.3	117	26.8	0.37	1.48	1.04	46.2	70.8							

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
23-058-SW-1	0.98 U	33.8	20	5.99 U	5 U	186 J	9450	0.038 U	2530	36.3	667	21.9	4950 JX	160
23-058-SW-2	2.42	30.3	22.3	5.99 U	5 U	377	15100	0.079 J	5360	48.1	958	18.3 U	5990	218
23-058-SW-3	3.56	10.8	34.7	11.5	5 U	917	41900	0.068 J	12400	92.8	1660	18.3 U	7980	327

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-058-SW-1	265	< 5.0	173	0.28	NR
23-058-SW-2	365	< 5.0	244	0.27	NR
23-058-SW-3	714	< 5.0	470	0.3	NR

**LEGEND**

- SE1 - Upgradient Daisy Creek  
 SE2 - Downgradient Daisy Creek  
 WR1 - Composite of subsamples WR1A and 1B  
 BACKGROUND - From the Tiger Mine (23-059-SS-1)
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Adit discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Tiger  
Legal Description: T 15N R 9E  
Mining District: Hughesville  
Latitude: N 47° 05' 29"  
Longitude: W 110° 36' 50"  
Land Status: Private/Public  
Quad: Mixes Baldy  
Inspectors: Tuesday, Belanger, Lasher  
Organization: Pioneer Technical Services, Inc.

County: Judith Basin  
Section(s): SW 1/4, NW 1/4, Sec. 5  
Mine Type: Hardrock/Pb, Ag, Zn  
Primary Drainage: Dry Fork Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Daisy Creek  
Date Investigated: June 3, 1993  
P.A. # 23-059

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 8,200 cubic yards. The following elements were elevated at least three times background:

Arsenic: 41.6J to 61.7J mg/kg	Mercury: 0.177 mg/kg
Cadmium: 5 to 13 mg/kg	Manganese: 5,060 mg/kg
Copper: 221J to 347J mg/kg	Nickel: 32.7 mg/kg
Iron: 183,000 mg/kg	Lead: 15,900 to 16,600 mg/kg
Antimony: 15.3J mg/kg	Zinc: 1,770 to 5,460 mg/kg
- Two adit discharges were associated with this site. Adit #1 had major flow (0.025 cfs); adit #4 had a slight discharge (not sampled) which seeped into the waste rock dump. The discharge from adit #1 exceeded the MCL for cadmium, as well as acute aquatic life criteria for cadmium, copper, lead, and zinc. The discharge from adit #1 also exceeded chronic aquatic life criteria for iron, cadmium, copper, lead, and zinc. The adit #1 discharge pH measurement was 5.9.
- The adit #1 discharge makes up the majority of the flow in intermittent Daisy Creek. Observed releases were documented for arsenic, cadmium, copper, iron, manganese, nickel, lead, and zinc in sediments and water. The MCL for cadmium was exceeded in the downstream Daisy Creek sample, which was directly attributed to the site. Additionally, acute aquatic life criteria were exceeded for copper, lead, and zinc, and chronic aquatic life criteria were exceeded for iron, copper, and zinc, which can all be directly attributed to the site.
- The on-site shaft was open and was potentially hazardous.

**Tiger PA# 23-059**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 06/03/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-059-SE-1	7.17 J	142 J	0.6 U	2.75	4.63 J	21.9 J	11500	0.09	542	7.09	165	4.48 UJ	179	NR
23-059-SE-3	58.3 J	381 J	14.5	4.57	10.8 J	325 J	71200	0.09	3850	29.8	8590	8.52 J	5140	NR
23-059-WR-1	61.7 J	86.5 J	4.6	2.23	5.36 J	347 J	183000	0.051	556	6.46	16600	4.5 J	1770	NR
23-059-WR-2	41.6 J	403 J	12.5	3.84	5.57 J	221 J	32000	0.177	5060	32.7	15900	15.3 J	5460	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.028	548	7.93	61.4	3.98 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL			SULFUR			PYRITIC			ORGANIC			PYRITIC			SULFUR		
	SULFUR %	ACID BASE	POTENT.	NEUTRAL	POTENT.	ACID BASE	SULFUR %	PYRITIC	SULFUR %	ORGANIC	SULFUR %	ACID BASE	ACID BASE	POTENT.	POTENT.	ACID BASE	ACID BASE	POTENT.
23-059-WR1	27.6	862	-0.1	-862	4.32	2.87	20.4	89.7	5	89.7	5	89.7	5	89.7	5	89.7	5	89.7
23-059-WR2	2.01	62.8	20.5	20.5	1.28	0.16	0.57	0.16	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-059-SW-1	0.98 U	47.7	2.55 U	5.99 U	5 U	2.7 J	33.3	0.038 U	4.4	8.78 U	4.33	21.8	7.8 JX	57.3
23-059-SW-2	2.33	31.4	14.1	5.99 U	7.53 J	353 J	14300	0.038 U	2160	25.6	657	18.3 U	3610 JX	144
23-059-SW-3	1.64	38	14	5.99 U	5 U	137 J	5630	0.038 U	1320	23.6	343	18.3 U	3460 JX	136

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-059-SW-1	80	< 5.0	11	0.09	NR
23-059-SW-2	245	< 5.0	155	0.66	NR
23-059-SW-3	232	< 5.0	126	0.27	NR

**LEGEND**

SE1 - Upstream.  
 SE3 - Downstream.  
 WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A, 2B, and 2C.  
 BACKGROUND - South of site across Dairy Creek near clear cut  
 From Tiger Mine (23-059-SS-1).

SW1 - Same as sample SE1.  
 SW2 - Add discharge.  
 SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Danny T  
Legal Description: T 15N R 9E  
Mining District: Hughesville  
Latitude: N 47° 04' 39.7"  
Longitude: W 110° 38' 0.7"  
Land Status: Private  
Quad: Barker  
Inspectors: Tuesday, Bisch, West  
Organization: Pioneer Technical Services, Inc.

County: Judith Basin  
Section(s): SE 1/4, NW 1/4, Section 7  
Mine Type: Hardrock/Ag. Pb, Zn  
Primary Drainage: Dry Fork Belt Creek  
USGS Code: 10030105  
Secondary Drainage: Galena Creek  
Date Investigated: July 11, 1994  
P.A. # 23-500

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock observed at the site was estimated to be 10,200 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 12.5JX mg/kg	Mercury: 0.15J mg/kg
Arsenic: 200J mg/kg	Lead: 3,140 mg/kg
Copper: 56.3 mg/kg	Zinc: 213 mg/kg
- The waste rock dump was actively eroding down the drainage toward Galena Creek.
- One discharging adit that eventually flowed into Galena Creek was observed at the site. The adit was sampled at its mouth (AD-1) and again after flowing over the waste rock dump (SW-1). At the mouth, the pH was 3.01, and the MCLs for arsenic, cadmium, and antimony and the EPA action level for lead were exceeded. In addition, the acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for iron and lead were exceeded. After flowing over waste rock, the pH of the discharge was 3.0, and the MCLs for arsenic, cadmium, and antimony were exceeded. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for arsenic, iron, and lead were also exceeded.
- Galena Creek was not sampled due to known poor water quality and abundant available data for the stream and the effect of the Marcelline Mine below the Danny T at Galena Creek.
- No hazardous mine openings (the adit was gated) or structures were observed at the site; however, abundant debris was scattered throughout the site.

Danny T. Mine PA# 23-500  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/1/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ag (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-500-WR1	200 J	12.5 JX	125	0.5 U	1.8 U	1.6	56.3	28300	0.15 J	105	1.6 U	3140	5.9 UJ	213	NR
BACKGROUND	4.5 UJ	0.5 UX	150	0.4 U	6.1	8.9	11.2	15100	0.04 J	770	11.1	31.5	5.0 UJ	59.7	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %/1000	NEUTRAL POTENT. %/1000	SULFUR ACID BASE POTENT. %/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE %/1000	SULFUR ACID BASE POTENT. %/1000
23-500-WR1	1.67	52.2	-7.53	-60	1.29	<0.01	0.38	0.00	-7.53

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-500-AD1	0.15	133	4.9	257 J	55.0	15.7	1010	142000	0.08 U	119000	40.8	144	96.1	58400	422
23-500-SW1	0.29	260	4.1	281 J	56.1	9.0	1130	142000	0.08 U	124000	40.7	113	107	62300	429

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-500-AD1	1790	<5	951	<0.05	NR
23-500-SW1	1850	<5	1050	<0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.  
BACKGROUND - From the Danny T. Mine (23-500-SW1).

AD1 - Ads discharge associated with WR1.  
SW1 - Ads discharge after flowing over WR1; just above Manholes dump.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Spring Hill Tailings</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>9N</u> R <u>4W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 4</u>
Mining District: <u>Helena</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 33' 29"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 06' 22"</u>	USGS Code: <u>10031101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Grizzly Gulch</u>
Quad: <u>Helena</u>	Date Investigated: <u>August 30, 1993</u>
Inspectors: <u>Tuesday, Flammang, Pierson</u>	P.A. # <u>25-067</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 378,500 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 485 to 4,800 mg/kg      Zinc: 302 mg/kg  
Iron: 182,000 mg/kg      Lead: 121J to 1,180J mg/kg
- Cyanide was present in TP-3 at 758 mg/kg.
- No flowing streams were observed on-site; consequently, no surface water or sediment samples were collected. However, a sample was collected (GW-1) from a spring located near the site which was used as a drinking water source. No MCL/MCLG exceedances were observed in the spring.
- The dam faces on TP-1 and TP-2 were steep and unstable, TP-3 was very steep and unstable; both were actively eroding. An adit located 300 feet west of TP-1 was currently open and potentially hazardous.

Spring Hill Tailings PA# 25-067  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/30/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-067-TP-1A	711	54.2 JX	3.3 J	6.88	13	36.3	38400	0.109 JX	328	10.4 J	97.4 J	6.7 UJ	196	3.1
25-067-TP-1B	485	58 JX	2.5 J	4.88	15.8	24.5	36700	0.064 JX	337	7.11 J	80.2 J	6.81 UJ	182	0.428
25-067-TP-2A	707	55.9 JX	2.2 J	5.81	13.9	59.6	48400	0.118 JX	323	11.9 J	124 J	6.46 UJ	164	7.15
25-067-TP-2B	887	89.7 JX	2.8 J	5.79	15.4	31.7	41100	0.192 JX	410	7.74 J	121 J	6.71 UJ	195	2.63
25-067-TP-3	4800	44 JX	2.1 J	19.1	12.8	334	182000	0.3 JX	152	10 J	1180 J	7.58 UJ	302	758
BACKGROUND	27.1	165 JX	1.3 J	13.6	17.9	29.7	23300	0.071 JX	672	17.9 J	36.3 J	6.98 UJ	76.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. %	PYRITIC SULFUR ACID BASE POTENT. %	SULFUR ACID BASE POTENT. %
25-067-TP-1A	1.39	43.4	126	82.8	0.88	0.23	8.75	117	165
25-067-TP-1B	1.45	45.3	173	127	0.85	0.58	7.5	100	165
25-067-TP-2A	2.02	63.1	111	48	1.24	0.43	10.9	100	165
25-067-TP-2B	1.48	46.2	184	138	0.38	0.61	15.3	168	168
25-067-TP-3DUP	18	561	-36	-597	-0.01	13.9	303	-339	-341
25-067-TP-3	17.9	560	-35	-595	-0.01	13.9	306	-341	-341

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
25-067-GW-1	14.1 J	2.5	2.57 U	9.7 U	10.6 J	5.1 J	17.2 JX	0.12 U	4.08 U	12.7 U	2.89 J	30.7 U	7.57 U	205
25-067-GW-2	23 J	2.01 U	2.57 U	9.7 U	8.83 J	17.6 J	15.1 JX	0.15	4.08 U	12.7 U	4.9 J	30.7 U	10.4	212
25-067-GW-3	4.42 J	2.01 U	2.57 U	9.7 U	6.83 U	6.8 J	11.8 UX	0.12 U	4.08 U	12.7 U	1.7 J	30.7 U	7.57 U	0.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
25-067-GW-1	265	< 5	52	0.31	< 0.005
25-067-GW-2	NR	NR	NR	NR	< 0.005
25-067-GW-3	NR	NR	NR	NR	< 0.005

LEGEND

- TP1A - Composite of subsamples TP1A-1, 1A-B, 1B-A, 1C-A, and 1C-B.  
TP1B - Composite of subsamples TP1A-C, 1A-D, 1A-E, 1B-C, 1B-B, and 1C-C.  
TP2A - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2B-A, and 2B-B.  
TP3 - Composite of subsamples TP3A, 3B, and 3C.  
BACKGROUND - From the Franklin Mine (25-339-SS-1).  
TP3DUP - Duplicate of sample 25-067-TP-3.
- GW1 - Spring which supplies residents.  
GW2 - Duplicate of sample GW1.  
GW3 - QA Blank.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Joslyn Street Tailings</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 10N R 4W</u>	Section(s): <u>NE 1/4, NE 1/4, SE 1/4, Section 23</u>
Mining District: <u>Helena</u>	Mine Type: <u>N/A</u>
Latitude: <u>N 46° 35' 49.1"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 03' 56"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Helena</u>	Date Investigated: <u>July 27, 1994</u>
Inspectors: <u>Tuesday, Clark, West</u>	P.A. # <u>25-501</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 4,900 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 8,520 to 29,300 mg/kg	Lead: 557 to 9,230 mg/kg
Cadmium: 6.4J to 128J mg/kg	Antimony: 54.0 to 238 mg/kg
Copper: 98.9 to 464 mg/kg	Zinc: 1,010 to 16,400 mg/kg
Mercury: 0.22 to 0.32 mg/kg	
- The tailings were located directly in a residential area and had exceptionally high concentrations of arsenic and lead. On-site residents were concerned about groundwater contamination and child exposure to these contaminants.
- No waste rock dumps, discharging adits, filled shafts, seeps, or springs were observed at the site. A small volume of ponded water was observed on one of the tailings areas. The ponded water was sampled for field parameters only (pH = 2.02, SC = 12,400 uS/cm).
- Groundwater samples were collected upgradient and downgradient from the site. No observed releases to groundwater were documented; and no MCLs were exceeded in either of the groundwater samples.

Joslyn Street Tailings PA# 25-501  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/27/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-501-TP1A	36.7 JX	13900	20.2	19.1 J	1.8	3.2 J	98.9	25300	0.22	47.5	2.6 U	3730	56.9	1900	1.522
25-501-TP1B	1.4 JX	8520	129	41.3 J	9.3	19.2 J	407	47200	0.08	1050	7.4	557	16.3	6130	0.657
25-501-TP2	59.0 JX	11800	137	6.4 J	1.7 U	27.3 J	432	58000	0.32	108	3.3	8850	54.0	1010	2.18
25-501-TP3	72.5 JX	29300	5.5	128 J	9.7	19.5 J	464	59700	0.16	571	3.3	9230	238	16400	<0.253
BACKGROUND	NR	27.1	165 JX	1.3 J	13.6	17.9	29.7	23300	0.071 JX	672	17.9 J	36.3 J	6.98 UJ	78.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		SULFATE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
25-501-TP1A	1.68	52.5	-8.08	-61	0.57	0.78	10.3	-18.4						
25-501-TP1B	3.99	125	-7.98	-133	3.74	0.25	0.00	-7.88						
25-501-TP2	1.83	57.2	0.50	-57	1.80	0.03	0.00	0.50						
25-501-TP3	5.55	173	-29.7	-203	<0.01	3.61	67.2	-96.8						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-501-GW1	0.12 U	9.3	52.3	0.13	8.4 U	6.8 U	5.9 U	14.0	0.18	2.3 U	14.4 U	4.2 J	3.4	15.6 U	343
25-501-GW2	0.12 U	4.5	49.6	0.09	8.4 U	6.8 U	5.9 U	12.3 U	0.11 U	2.3 U	14.4 U	1.1 U	2.4 U	20.3	196

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-501-GW1	447	29	81	4.92	<0.005
25-501-GW2	257	<5	38	0.85	<0.005

LEGEND

- TP1A - Composite of subsamples TP1A-1, TP1A-2, TP1A-3, TP1A-4, TP1A-5, TP1A-6, TP1A-7, TP1A-8, TP1A-9, TP1A-10, TP1A-11, TP1A-12, TP1A-13, TP1A-14, TP1A-15, TP1A-16, TP1A-17, TP1A-18, TP1A-19, TP1A-20, TP1A-21, TP1A-22, TP1A-23, TP1A-24, TP1A-25, TP1A-26, TP1A-27, TP1A-28, TP1A-29, TP1A-30, TP1A-31, TP1A-32, TP1A-33, TP1A-34, TP1A-35, TP1A-36, TP1A-37, TP1A-38, TP1A-39, TP1A-40, TP1A-41, TP1A-42, TP1A-43, TP1A-44, TP1A-45, TP1A-46, TP1A-47, TP1A-48, TP1A-49, TP1A-50, TP1A-51, TP1A-52, TP1A-53, TP1A-54, TP1A-55, TP1A-56, TP1A-57, TP1A-58, TP1A-59, TP1A-60, TP1A-61, TP1A-62, TP1A-63, TP1A-64, TP1A-65, TP1A-66, TP1A-67, TP1A-68, TP1A-69, TP1A-70, TP1A-71, TP1A-72, TP1A-73, TP1A-74, TP1A-75, TP1A-76, TP1A-77, TP1A-78, TP1A-79, TP1A-80, TP1A-81, TP1A-82, TP1A-83, TP1A-84, TP1A-85, TP1A-86, TP1A-87, TP1A-88, TP1A-89, TP1A-90, TP1A-91, TP1A-92, TP1A-93, TP1A-94, TP1A-95, TP1A-96, TP1A-97, TP1A-98, TP1A-99, TP1A-100, TP1A-101, TP1A-102, TP1A-103, TP1A-104, TP1A-105, TP1A-106, TP1A-107, 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**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Seven-Up Pete  
Legal Description: T 14N R 7W  
Mining District: Lincoln  
Latitude: N 46° 57' 30"  
Longitude: W 112° 30' 00"  
Land Status: Private  
Quad: Swede Gulch  
Inspectors: M. Babits, S. Babits/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Lewis and Clark  
Section(s): NE 1/4, Sec. 29  
Mine Type: Hardrock/Unknown  
Primary Drainage: Blackfoot River  
USGS Code: 17010203  
Secondary Drainage: Seven-Up Pete Creek  
Date Investigated: September 7, 1993  
P.A. # 25-020

- An extremely small volume of tailings was identified at this site; no samples were collected.
- The volume of waste rock associated with this site was estimated to be approximately 20,800 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 71.1J to 309J mg/kg      Mercury: 0.49J to 0.826J mg/kg
- Three discharging adits were identified at the site, one of which directly entered surface water. No MCLs were exceeded in a sample of this discharge; however, the chronic aquatic life criteria for cadmium and mercury were exceeded. The discharge pH measurement was 8.36.
- An unnamed tributary to Seven Up Creek flowed through the center of the site (adjacent to several waste rock piles). Surface water and sediment samples were collected upstream and downstream from the site. No MCLs were exceeded; however, chronic aquatic life criteria were exceeded for mercury both upstream and downstream from the site.
- An observed release to the unnamed tributary (sediment) was documented for arsenic.
- One potentially hazardous open adit and numerous hazardous structures were identified at the site.

Seven Up Pete PA# 25-020  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/07/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-020-SE-1	26.3 J	290 J	1.2 U	6.5	11.9	23.7 J	14000	0.238 J	1310 J	34.2 J	22.2 J	14.3 U	132 J	NR
25-020-SE-2	185 J	220 J	0.6	15.7	14.9	52.3 J	25000	0.085 J	462 J	61.8 J	10.1 J	5.79 U	61.6 J	NR
25-020-WR-1	309 J	180 J	0.6 U	3.73	6.27	36.4 J	25000	0.49 J	93.3 J	10.9 J	27.3 J	6.99 U	51 J	NR
25-020-WR-2	71.1 J	228 J	1.0 U	6.73	4.47	21.6 J	16400	0.829 J	292 J	18.2 J	35.1 J	5.9 U	55.7 J	NR
BACKGROUND	19.5 J	168 J	1.0 U	9.67 J	36.5 J	228 JX	12800	0.033 UX	468	30.4 J	34.4	6.95 UJ	66.9 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
25-020-WR-1	0.43	13.4	1.3	0.54	-12	0.23	0.05	0.05	0.15	1.56	0.06	0.06	0.62	-0.26	-0.09	-0.09
25-020-WR-2	0.17	5.31			-4.8	0.09	0.02	0.02								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-020-SW-1	3.97	202	2.57 U	9.7 U	6.83 U	11 J	1300	0.19 JX	130	17.1 JX	3.4	30.7 U	16.6 J	100
25-020-SW-2	5.41	128	2.93 J	9.7 U	6.83 U	11.7 J	395	0.12 UJX	43.1	25.3 JX	3.8	30.7 U	21.4 J	130
25-020-SW-5	9.14	29.1	4.6 J	9.7 U	6.83 U	6.17 J	256	0.15 JX	87.5	24.7 JX	2.17	30.7 U	36.4 J	148

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-020-SW-1	191	< 5.0	12	0.22	NR
25-020-SW-2	256	< 5.0	42	< 0.05	NR
25-020-SW-5	276	< 5.0	47	0.37	NR

LEGEND

- SE1 - 200 feet upgradient in unnamed tributary.  
SE2 - Downgradient at toe of waste rock dump 1 in unnamed tributary.  
WR1 - Composite of WR1A and 1B.  
WR2 - Sample of the WR2A subsample.  
BACKGROUND - From the Swansea Tailings (25-208-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Adit discharge at waste rock dump 2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Blackfoot Tailings</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>14N</u> R <u>9W</u>	Section(s): <u>E 1/2, NE 1/4, NE1/4, Sec. 29</u>
Mining District: <u>Lincoln</u>	Mine Type: <u>Tailings Dump (Millsite)</u>
Latitude: <u>N 46° 56' 33"</u>	Primary Drainage: <u>Blackfoot River</u>
Longitude: <u>W 112° 45' 10"</u>	USGS Code: <u>17010203</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Lincoln Gulch</u>
Quad: <u>Moose Creek</u>	Date Investigated: <u>September 7 and 8, 1993</u>
Inspectors: <u>M. Babits, S. Babits/Pierson</u>	P.A. # <u>25-322</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 5,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 33.7J to 402J mg/kg	Cadmium: 0.9 to 114 mg/kg
Cobalt: 23.6 to 54.3 mg/kg	Chromium: 15.2 to 45.9 mg/kg
Copper: 57.9 to 13,400 mg/kg	Iron: 27,900 to 205,000 mg/kg
Mercury: 0.104J to 2.52J mg/kg	Nickel: 18.4J to 57.9J mg/kg
Lead: 48J to 8,700J mg/kg	Zinc: 157J to 10,500J mg/kg
- No waste rock was observed at this site during the investigation.
- One upgradient (GW-5) and two downgradient (GW-1 and 6) groundwater samples were collected during the investigation. Observed releases to groundwater were documented for arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc. MCLs were exceeded for copper, chromium, mercury, and nickel in the downgradient sample, which were attributable to the site.
- No surface water was observed on site. The nearest surface water, the Blackfoot River, was located approximately 180 feet east of the site. No surface water samples were collected due to likely excessive dilution.
- No hazardous mine openings were identified at the site.

## INVESTIGATION DATE: 09/07/93

### Materials in scope

[illegible]

Water for Water

FIELD ID	As	Be	Ca	Co	Cr	Cs	Fe	Rb	Mn	Ni	Pb	Sb	Zn	Ca/Cr	mg Ca/Cr0.013	CALC.
26-322-GW-1	633	6360	440 J	153	312	7570 J	474000	5.44 JX	15300	357 JX	26800	30.7 U	33100 J			897
26-322-GW-1(D)	5.72	7.23	29.1 J	41.2	6.83 U	2.8 J	6840	0.12 U	10500	48.7	6.76	30.7 U	8000			416
26-322-GW-5	141 JX	591	10.6	92.1	79.2	567	217000	0.12 U	8850	95.3	27.2	30.7 UJX	590			290
26-322-GW-5(D)	0.96 U	17.9	2.57 U	9.7 U	6.83 U	2.13 J	22.3	0.12 U	57.7	12.7 U	0.78	30.7 U	19			152
26-322-GW-6	17.4 JX	163	2.57 U	9.7 U	6.83 U	13.1	2300	0.16	3.1	12.7 U	0.16	30.7 UJX	43.2			174
26-322-GW-6(D)	4.4	92	2.57 U	9.7 U	6.83 U	3.07 J	11.8 U	0.12 U	4.08 U		0.89	30.7 U	28.8			200

U = Not Detected; J = Estimated Quantity; X = Outlier for Accuracy or Precision; NR = Not Reported

**01-1-A City Council action:**

Wet Chemistry Results in mg/l		CYANIDE				SULFATE				CHLORIDE				NOMANOL-N			
FIELD	LAB.	TOTAL	DISSOLVED	SOLIDS													
25-322-GW-1		766	<	5.0	18.0	410	0.008										
25-322-GW-5		210	<	5.0	5.0	0.2	<	0.005									
25-322-GW-8		236	<	5.0	5.0	0.13	<	0.005									
TP1ED - 4-2'; dark purple sand.																	
TP1CA - 40' North of TP1B borings; gray sand with clay.																	
TP1CB - 25' East of TP1B borings; 0-1.2'; gray sand.																	
TP1ACDUP - Duplication.																	
GW1 - N. end of 40' SWL 2.9' and TD 3.7' logs. (7-3).																	
TP1ACDUP - Duplication.																	
GW1 - N. end of 40' SWL 2.9' and TD 3.7' logs. (7-3).																	
GW1D - Sample GW1 for Total Dissolved Metals.																	
GW5 - On east bubbled chimney west of the (900), SWL 2.35' and TD 33' logs.																	
GW5D - Sample GW5 for Total Dissolved Metals.																	
GW5D - Sample GW5 for Total Dissolved Metals.																	
GW5 - River floodplain R. at Bay 200 E. of abut SWL 3.70' and TD 37' logs. (401-92)																	
GW5D - Sample GW5 for Total Dissolved Metals.																	
BACKGROUND - Above value. From Background Tallage (25-322-85-1)																	



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Drumlummon Mine, Mill, and  
Tailings

**Legal Description:**

Mine/Mill T 12N R 6W and T 11N R 6W

Tailings T 12N R 5W and T 11N R 5W

Mining District: Marysville

Latitude: N 46° 44' 36"; N 46° 44' 58"

Longitude: W 112° 17' 45"; W 112° 15' 28"

Land Status: Private/Public

Quad: Greenhorn Mountain and Canyon Creek

Inspectors: Tuesday, Belanger, Clark, West

Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark

Mine/Mill Section(s): SE 1/4, Section 36 and  
NW 1/4, N 1/2, Section 1

Tailings Section(s): SE 1/4, S 1/2, Section 34  
and NE 1/4, NE 1/4, Section 31

Mine Type: Hardrock/Cu, Au, Ag, Pb, Zn, Mo

Primary Drainage: Silver Creek

USGS Code: 10030101

Secondary Drainage: Silver Creek

Date Investigated: June 23-24, 1994

P.A. # 25-024

- The volume of tailings observed at the site was estimated to be 178,630 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 27.4 mg/kg	Arsenic: 33.7 to 35.1 mg/kg
Copper: 116 to 149 mg/kg	Mercury: 1.85JX to 1.94JX mg/kg
Lead: 112 to 117 mg/kg	Zinc: 205J to 257J mg/kg
- The volume of waste rock observed at the site was estimated to be 9,020 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 5 mg/kg	Arsenic: 46.2 mg/kg
Cadmium: 2.8J mg/kg	Copper: 55.3 mg/kg
Mercury: 0.41JX to 1.43JX mg/kg	Lead: 119 mg/kg
Zinc: 311J mg/kg	
- One discharging adit was observed at the site. The discharge flowed a short distance to a small pond. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for iron was exceeded.
- Silver Creek flows adjacent to the site on the northwest side. An observed release to Silver Creek (sediment) was documented for mercury; however, no MCLs or aquatic life criteria were exceeded in the stream.
- Potential safety hazards observed at the site included four open shafts, two highwalls associated with two large open pits, and a collapsing loadout structure.

Drumilumon Mine/Mill PAF 25-024  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/23 & 24/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-024-SE1	1.9	30.5	148 J	0.8	6.1	13.9 J	38.8	16100	0.18	1050 J	7.7	203	6.2 U	198	NR
25-024-SE2	4.5	19.8	150 J	0.7	6.0	8.7 J	30.6	13100	6.20	490 J	6.4	62.0	7.4 U	73.7	NR
25-024-SE3	18.8	13.5	71.8 J	1.5	3.9	9.0 J	60.7	9120	3.78	742 J	4.9	77.7	5.4 U	123	NR
25-024-TP1	27.4	33.7	99.2	0.7	4.3	12.5	149	11100	1.94 JX	744	8.0	112	16.1 J	257 J	0.401
25-024-TP2	27.4	35.1	61.3	0.7	3.0	10.2	116	9230	1.85 JX	626	5.9	117	12.9 J	205 J	0.219
25-024-WR1	0.4 U	21.7	46.2	0.4 UJ	5.6	16.9	30.1	23300	0.41 JX	491	9.8	12.1	4.3 UJ	59.6 J	NR
25-024-WR2	5	46.2	57.0	2.8 J	4.2	9.3	55.3	13200	1.43 JX	727	6.1	119	5.7 UJ	311 J	NR
BACKGROUND	0.7 U	8.2	312 J	0.8 U	5.6	15.0 J	12.1	14500	0.03 U	454 J	9.8	8.56 U	6.9 U	58.1	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR	TOTAL ACID BASE	NEUTRAL POTENT.	SULFUR ACID BASE	SULFATE	PYRITIC	ORGANIC	PYRITIC	SULFUR	SULFUR	SULFUR	SULFUR	SULFUR
	%	1/1000	POTENT. 1/1000	POTENT. 1/1000	%	%	%	%	1/1000	1/1000	1/1000	1/1000	1/1000
25-024-TP1	0.01	0.31	72.6	72.3	<0.01	<0.01	0.01	0.00	0.00	72.6			
25-024-TP2	0.01	0.31	82.0	81.7	<0.01	<0.01	0.01	0.00	0.00	82.0			
25-024-WR1	0.04	1.25	153	152	<0.01	0.07	0.05	2.19	151				
25-024-WR2	0.15	4.69	91.3	86.6	0.07	0.03	0.05	0.94	90.4				

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-024-AD1	0.14	34.9	128	2.6 U	8.7 U	4.7 UX	4.6 U	2140	0.11 U	1640	8.0 U	2.1	29.4 U	6.07	319
25-024-SW1	0.12 U	2.2	94.0	2.6 U	8.7 U	4.9 JX	4.6 U	44.1	0.11 U	8.0	9.8	2.9	29.4 U	6.67	144
25-024-SW2	0.12 U	2.1	61.9	2.6 U	8.7 U	4.7 UX	4.6 U	91.4	0.11 U	21.8	8.0 U	2.3	29.4 U	4.5 U	139
25-024-SW3	0.12 U	3.6	74.4	2.6 U	8.7 U	5.9 JX	7.3	262	0.11 U	41.3	8.0 U	6.8	29.4 U	13.7	188

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-024-AD1	309	<5	24	<0.05	NR
25-024-SW1	137	<5	8.0	0.15	NR
25-024-SW2	148	<5.0	12	0.16	NR
25-024-SW3	177	<5	18	0.14	NR

LEGEND

SE1 - Ottawa Gold (Silver Check) system of mine and mill.  
SE2 - Silver Check below mine, mill, and TP1.  
SE3 - Silver Check below tailings from TP2, two other below mill.  
TP1 - Composite of subsamples TP2A-1 through 2A1.  
TP2 - Composite of subsamples TP2B and 2C.  
WR1 - Composite of subsamples WR1 and 2.  
WR2 - Composite of subsamples WR3 and 4A through 4C.  
BACKGROUND - From the Drumilumon Mine/PAF (25-024-SE1).

AD1 - Acid discharge on WR4.  
SW1 - Same as sample 25-024-SE1.  
SW2 - Same as sample 25-024-SE2.  
SW3 - Same as sample 25-024-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bald Mountain</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>12N</u> R <u>6W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 35</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 44' 55"</u>	Primary Drainage: <u>Silver Creek</u>
Longitude: <u>W 112° 19' 15"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Jennies Fork</u>
Quad: <u>Greenhorn Mountain</u>	Date Investigated: <u>August 19, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>25-061</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 64,950 cubic yards. The following elements were elevated at least three times background:

Mercury: 0.964 mg/kg	Manganese: 2,200 mg/kg
Lead: 84.5 mg/kg	Antimony: 9.83 mg/kg
Zinc: 256 mg/kg	
- The volume of waste rock associated with this site was estimated to be approximately 23,100 cubic yards; however, metals concentrations were not significantly elevated (<3X) above background concentrations.
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- No surface water was observed on or near the site during the investigation. The nearest surface water, Jennies Fork, was located approximately 0.5 miles from the site; consequently, no surface water or sediment samples were collected.
- Four potentially hazardous partially collapsed shafts were identified at the site.

Bald Mountain PA# 25-061  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/19/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-061-TP-1	14.3	50.4	0.9 UJ	3.62 J	5.94 J	79.1	9450	0.523	2200	4.55 J	142	6.37 U	256	NR
25-061-TP-2	16.5	117	1.0 UJ	3.68 J	3.73 J	56.4	9870	0.964	1810	4.72 J	84.5	9.83	158	NR
25-061-WR-1	48.8	64.7	0.7 UJ	6.81 J	5.51 J	36.6	14200	0.324	994	7.37 J	41.7	4.7 U	125	NR
BACKGROUND	25 J	650	0.4 UJ	5.6	10.7	32.6	14700	0.187	662	14 J	28	3 UJ	75	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
25-061-TP-1	0.07	2.19	38.7	36.6	0.03	0.01	0.03	0.31	38.4
25-061-TP-2	0.01	0.31	60.1	59.8	<0.01	0.01	0.01	0.31	59.8
25-061-TP-2DUP	<0.01	0	60.3	60.3	<0.01	0.01	0.01	0.31	60
25-061-WR-1	0.02	0.62	57.9	57.2	<0.01	<0.01	0.03	0	57.9

LEGEND

TP1 - Composite of subsamples TP1A, 1B, 2A-A, 2A-B, 2A-C, and 2B-A.  
TP2 - Composite of subsamples TP2B-B and 2B-C.  
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
BACKGROUND - From the Big Ox Mine (25-116-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Big Ox Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 12N R 6W</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 24</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Au, Ag, Cu, Pb</u>
Latitude: <u>N 46° 47' 33"</u>	Primary Drainage: <u>Little Prickly Pear Creek</u>
Longitude: <u>W 112° 18' 12"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Deer Creek</u>
Quad: <u>Canyon Creek</u>	Date Investigated: <u>June 9, 1993</u>
Inspectors: <u>Bullock, Lasher/Pierson</u>	P.A. # <u>25-115</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 1,500 cubic yards of tailings on site. The following elements were elevated at least three times background:

Arsenic: 285J mg/kg	Cadmium: 221 mg/kg
Copper: 1,130 mg/kg	Mercury: 6.07 mg/kg
Manganese: 2,500 mg/kg	Lead: 10,900 mg/kg
Antimony: 107J mg/kg	Zinc: 24,000 mg/kg
- There was no waste rock on site. The mine was the Big Ox Mine P.A. #25-116.
- There were no discharging mine openings on site.
- Deer Creek was flowing through the tailings at the time of this investigation. There was an observed release of lead in downstream surface water. No MCL/MCLGs were exceeded. The chronic aquatic life criteria for lead was exceeded in downstream surface water. Stream sediment samples also documented releases of arsenic, cadmium, copper, mercury, manganese, lead, antimony, and zinc.
- There were no hazardous openings on site. There were numerous collapsing buildings including the mill that were classified as hazardous, but may be of some historical significance.

Big Ox Millsite PA# 25-115  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-115-SE-1	138 J	42.1	84	4.8	4.8	426	21400	8.84	3280	20 J	6790	54 J	8810	NR
25-115-SE-2	22 J	86.7	0.5 UJ	3.2	10.1	10.8	10300	0.095	209	9 J	18	4 UJ	62	NR
25-115-TP-1	285 J	25.8	221	5.6	3.3	1130	27500	6.07	2500	19 J	10900	107 J	24000	NR
BACKGROUND	25 J	650	0.4 UJ	5.6	10.7	32.6	14700	0.187	662	14 J	28	3 UJ	75	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	POTENT.	ACID BASE	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	SULFUR	ACID BASE	POTENT.	ACID BASE
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
25-115-TP-1	4.26	133	146	13.9	0.29	1.62	2.35	50.6	95.5					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-115-SW-1	10.5	52.7	2.55 U	5.99 U	7.7	4.27	22.8	0.19	3.6	12.1	28.9	18.3 U	32.1	212
25-115-SW-2	10.1	73.1	2.87	5.99 U	5 U	2.43	986	0.18	21.8	8.78 U	3.82	18.3 U	18.8	242

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-115-SW-1	223	< 5.0	25	< 0.05	NR
25-115-SW-2	283	< 5.0	24	0.19	NR

LEGEND

SE1 - Deer Creek below tailings @ the dam breach.  
SE2 - Upgradient sample @ the old well casing.  
TP1 - Composite of subsamples TP1-1A, 1-1B, and 1-2A.  
BACKGROUND - From the Big Ox Mine (25-116-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Big Ox Mine</u> Legal Description: T <u>12N</u> R <u>6W</u> Mining District: <u>Marysville</u> Latitude: <u>N 46° 47' 28"</u> Longitude: <u>W 112° 17' 45"</u> Land Status: <u>Private</u> Quad: <u>Canyon Creek</u> Inspectors: <u>Babits, Flammang</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Lewis and Clark</u> Section(s): <u>NE 1/4, SE 1/4, Sec. 13</u> Mine Type: <u>Hardrock/Au, Ag, Pb, Cu</u> Primary Drainage: <u>Little Prickly Pear Creek</u> USGS Code: <u>10030101</u> Secondary Drainage: <u>Deer Creek</u> Date Investigated: <u>June 9, 1993</u> P.A. # <u>25-116</u>
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- Ore derived from this mine was milled at the Big Ox Mill (P.A.# 25-115), which was investigated in conjunction with this site.
  
- The volume of waste rock associated with this site was estimated to be approximately 3,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 77J mg/kg	Cadmium: 9.6 to 11.3 mg/kg
Copper: 111 to 260 mg/kg	Mercury: 1.08 mg/kg
Lead: 596 to 1,680 mg/kg	Antimony: 9J to 16J mg/kg
Zinc: 1,200 to 1,550 mg/kg	
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
  
- No surface water was observed on or near the site. The nearest surface water was located approximately 1,500 feet away; consequently, no surface water or sediment samples were collected.
  
- One potentially hazardous partially open adit was identified at the site.

Big Ox Mine PA# 25-116  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-116-WR-1	53 J	167	9.6	16.6	11	260	25200	0.247	700	10 J	596	16 J	1200	NR
25-116-WR-2	25 J	232	0.4 UJ	6.8	12.3	19.7	14400	0.147	591	13 J	24	3 UJ	49	NR
25-116-WR-4	77 J	138	11.3	5.4	11.9	111	18400	1.08	827	12 J	1680	9 J	1550	NR
BACKGROUND	25 J	650	0.4 UJ	5.6	10.7	32.6	14700	0.187	662	14 J	28	3 UJ	75	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL SULFUR %	ACID BASE POTENT. V/1000t	SULFUR POTENT. V/1000t	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR V/1000t	ACID BASE POTENT. V/1000t	SULFUR POTENT. V/1000t
25-116-WR-1	0.89	27.8	203	175	<0.01	0.96	30	173	173

LEGEND

WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Sample of the WR2 subsample.  
WR4 - Composite of subsamples WR4A, 4B, 7A, and 7B.  
BACKGROUND - SE of mill building on top of hill before mines.  
From the Big Ox Mine (25-116-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Belmont</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>12N</u> R <u>6W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 35</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 44' 45"</u>	Primary Drainage: <u>Silver Creek</u>
Longitude: <u>W 112° 19' 05"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Rawhide Gulch</u>
Quad: <u>Greenhorn Mountain</u>	Date Investigated: <u>August 19, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>25-167</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 57,030 cubic yards. The following elements were elevated at least three times background:  
Mercury: 0.464 to 1.93 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 18,800 cubic yards. The following elements were elevated at least three times background:  
Mercury: 0.723J mg/kg
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- No surface water was observed on or near the site. The nearest surface water was located over 1,000 feet from the site; consequently, no surface water or sediment samples were collected.
- Potential safety hazards associated with this site included three open stopes, a collapsing mill building, and several oversteepened and unstable slopes.

Belmont PA# 25-167  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BABITS  
 INVESTIGATION DATE: 08/19/83

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-167-TP-1	28	30.2	1.0 UJ	1.61 J	2.87 J	56.8	6510	1.93	1190	2.38 U	48.4	10	230	NR
25-167-TP-2	32.2	36.2	0.7 UJ	1.85 J	2.61 J	38.1	6840	0.464	1520	3.54 J	38.1	5.74	208	<0.277
25-167-WR-1	19 J	26.5 J	0.4 U	3.07	4.46	35.8 J	10700 J	0.723 J	630 J	5.27	14.6 J	4.97 U	65.6 J	NR
BACKGROUND	38 J	239	0.5 UJ	8.2	14.1	49.7	19500	0.122	1000	15 J	80	4 J	153	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
25-167-TP-1	<0.01	0	74.3	74.3	<0.01	<0.01	0.01	0	74.3
25-167-TP-2	<0.01	0	74.4	74.4	<0.01	<0.01	<0.01	0	74.4
25-167-WR-1	<0.01	0	96.8	96.8	<0.01	0.01	0.01	0.31	96.5

LEGEND

TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1A-D, 1A-E, and 1A-F.  
 TP2 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2A-D, and 3.  
 WR1 - Composite of subsamples WR1A, 1B, 2, and 3.  
 BACKGROUND - From Empire Millsite (25-175-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Piegan Gloster Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>12N</u> R <u>6W</u>	Section(s): <u>Sec. 21 and Sec. 27</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 46' 12"</u>	Primary Drainage: <u>Little Prickly Pear Creek</u>
Longitude: <u>W 112° 20' 43"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Piegan Creek</u>
Quad: <u>Canyon Creek</u>	Date Investigated: <u>September 1, 1993</u>
Inspectors: <u>M. Babits, S. Babits, Flammang,</u>	P.A. # <u>25-172</u>
<u>Bullock/Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 335,820 cubic yards. The following elements were elevated at least three times background:

Cadmium: 4.3 to 7.7 mg/kg	Copper: 157JX to 272JX mg/kg
Mercury: 1.17JX mg/kg	Manganese: 3,820 to 5,110 mg/kg
Lead: 112 to 1,940 mg/kg	Zinc: 400J to 2,620J mg/kg
- No waste rock was observed at this site during the investigation.
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- Piegan Creek was flowing directly through the tailings at this site. Surface water and sediment samples were collected upstream and downstream from the site. Observed releases to Piegan Creek were documented for manganese and zinc. The chronic aquatic life criteria for lead was exceeded in the downstream sample, which was directly attributable to the site.
- Observed releases to Piegan Creek (sediment) were also documented for copper and lead.
- No hazardous mine openings were identified at the site; however, the mill building was collapsing and potentially hazardous.

Piegan Gloster Mill PA# 25-172  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/01/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-172-SE-1	9.34 U	43.1 J	1.8 U	2.82 J	8.39 J	26 JX	9170	6 JX	225	4.26 U	102	12.4 UJ	119 J	0.464 U
25-172-SE-2	33.1 J	148 J	2.5	3.47 J	7.34 J	83 JX	10700	1.62 JX	2670	8.61 J	698	6.44 UJ	865 J	0.339
25-172-TP-1	49 J	59.3 J	0.9 U	3 J	3.24 J	45.7 JX	11100	1.17 JX	537	2.14 U	112	6.21 UJ	400 J	0.919
25-172-TP-2	47.5 J	179 J	4.3	3.39 J	8.52 J	157 JX	11900	0.165 JX	3820	7.71 J	1290	6.38 UJ	1620 J	9.96
25-172-TP-3	66.5 J	271 J	7.7	4.76 J	11.3 J	272 JX	14000	0.274 JX	5110	10.1 J	1940	6.89 J	2620 J	7.92
BACKGROUND	33.3 J	150 J	0.9 U	6.26 J	14.3 J	35.8 JX	14700	0.367 JX	729	10.6 J	34.4	6.4 UJ	83.1 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			SULFATE			PYRITIC			ORGANIC			PYRITIC			SULFUR		
	TOTAL %	ACID BASE	NEUTRAL	ACID BASE	POTENT.	POTENT.	SULFUR	SULFUR	%	SULFUR	ACID BASE	ACID BASE	SULFUR	%	%	SULFUR	ACID BASE	POTENT.	ACID BASE	POTENT.	POTENT.
25-172-TP-1	<0.01	0	28.6	28.6	78	78	<0.01	<0.01	<0.01	<0.01	0	0.01	0.03	0.04	0.04	0.62	0.31	28.6	76.7	102	102
25-172-TP-2	0.04	1.25	77.3	77.3	102	102	<0.01	<0.01	<0.01	0.02	0.02	0.01	0.03	0.04	0.04	0.62	0.31	76.7	76.7	102	102
25-172-TP-3	0.07	2.19	102	102	102	102	0.02	0.02	0.02	0.01	0.01	0.01	0.04	0.04	0.04	0.31	0.31	102	102	102	102

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-172-SW-1	5.42 J	36.9	2.57 U	9.7 U	6.83 U	9.87 J	243 JX	0.12 U	10.8	12.7 U	5.06 J	30.7 U	7.57 U	184
25-172-SW-2	6.58 J	53.2	2.57 U	9.7 U	9.57 J	4.6 J	118 JX	0.12 U	50.2	12.7 U	13.6 J	30.7 U	29.3	219

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-172-SW-1	202 <	5	18	0.11 <	0.005
25-172-SW-2	218 <	5	20	0.05 <	0.005

LEGEND

- SE1 - Upgradient in Piegan Creek below confluence of 2 tributaries.  
SE2 - Downgradient in Piegan Creek below tailings pond 3, before placer.  
TP1 - Composite of subsamples TP1A-A, 1A-B, and 1B-A.  
TP2 - Composite of subsamples TP2A-A through 2A-D, 2B-A through 2B-C, and 4A through 4C.  
TP3 - Composite of subsamples TP3A-A, 3A-B, 3A-C, 3A-D, 3B-A, 3B-B, and 3B-C.  
BACKGROUND - From the Piegan Gloster Mill (25-172-SW-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Empire Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 12N R 6W</u>	Section(s): <u>Sec. 32 and 33</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Au, Ag, Pb, Zn</u>
Latitude: <u>N 46° 45' 25"</u>	Primary Drainage: <u>Little Prickly Pear Creek</u>
Longitude: <u>W 112° 21' 45"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Empire Creek</u>
Quad: <u>Canyon Creek and Granite Butte</u>	Date Investigated: <u>June 9, 1993</u>
Inspectors: <u>Bullock, Babits, Flammang, Clark, Lasher/Pierson</u>	P.A. # <u>25-175</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	
<u>/Thomas, Dean and Hoskins, Inc.</u>	

- The volume of mill tailings associated with this site was estimated to be approximately 16,000 cubic yards. The following elements were elevated at least three times background:

Cadmium: 13.4 to 83.7 mg/kg	Copper: 1840 to 6660 mg/kg
Mercury: 0.505 to 0.893 mg/kg	Lead: 7310 to 13,700 mg/kg
Antimony: 15J to 54J mg/kg	Zinc: 5020 to 39,300 mg/kg
- There was no waste rock associated with this site.
- There were no discharging adits or shafts, or seeps or springs associated with this site.
- Empire Creek flowed through the mill tailing for approximately 4000 feet adjacent to and below the mill. Observed releases were documented for copper, lead, and zinc. There were no MCL/MCLGs exceeded during this sampling event. The chronic aquatic life criteria for lead was exceeded and directly attributable to this site. Cyanide was also slightly elevated in the downgradient sample, but did not constitute an observed release.
- The mill building was a hazardous structure, although may be historically significant.
- Other possible hazardous materials on site included a partially full 55-gallon barrel of black petroleum sludge and several barrels of unknown white powdery material; all located inside the mill building.

Empire Mill PA# 25-175  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-175-SE-1	32 J	169	1.3 UJ	3.8	13.8	123	13400	0.443	192	5 J	425	9 UJ	501	1.88
25-175-SE-2	66 J	77.9	41.8	5.2	15.7	3350	18900	0.649	1690	15 J	7270	38 J	20000	0.87
25-175-TP-1	88 J	98.7	83.7	8.2	42.6	6660	26300	0.893	2390	27 J	13700	54 J	39300	0.18
25-175-TP-2	30 J	28.8	13.4	1.2	7.5	1840	9700	0.505	1660	11 J	7310	15 J	5020	0.87
25-175-TP-3	47 J	64.9	38.2	5.1	24.1	4160	18800	0.769	2340	17 J	10600	28 J	15600	0.99
BACKGROUND	38 J	239	0.5 UJ	8.2	14.1	49.7	19500	0.122	1000	15 J	80	4 J	153	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	PYRITIC SULFUR ACID BASE POTENT. /1000x
25-175-TP-1	0.02	0.62	108	108	0.02	0	108
25-175-TP-2	<0.01	0	110	110	0.02	0	110
25-175-TP-3	0.05	1.56	141	139	0.02	0.94	140

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-175-SW-1	5.62	46.4	3.2	5.99 U	5 U	1.35 U	20.6	0.14	2.6 U	8.78 U	2.2	18.3 U	6 U	173
25-175-SW-2	3.59	94.1	2.55 U	5.99 U	5 U	13.4	22.8	0.14	6.27	8.78 U	13.6	18.3 U	85.5	179

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-175-SW-1	195	< 5.0	20	0.27	0.01
25-175-SW-2	201	< 5.0	18	< 0.05	0.02

LEGEND

- SE1 - Upgradient Empire Creek, 25' upstream from where creek crosses the road.  
SE2 - At the culvert below new dam.  
TP1 - Composite of subsamples TP2A and 3-2A.  
TP2 - Composite of subsamples TP3-1C, 3-2B, and 3-2C.  
TP3 - Composite of subsamples TP3-1D and 3-2D.  
BACKGROUND - Same as Empire Mill (25-175-SW-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bald Butte Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>11N</u> R <u>6W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 16</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 42' 13"</u>	Primary Drainage: <u>Dog Creek</u>
Longitude: <u>W 112° 21' 24"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Dago Creek</u>
Quad: <u>Greenhorn Mountain</u>	Date Investigated: <u>August 18, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>25-179</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailingw associated with this site was estimated to be approximately 48,700 cubic yards. The following elements were elevated at least three times background:

Arsenic: 191J to 202J mg/kg	Cadmium: 14.9 to 18.8 mg/kg
Copper: 538J to 852J mg/kg	Mercury: 0.596J to 17.5J mg/kg
Lead: 612J to 2,500J mg/kg	Zinc: 1,940J to 2,750 mg/kg
- The volume of waste rock associated with this site was estimate to be approximately 850 cubic yards. The following elements were elevated at least three times background:

Arsenic: 11,800J mg/kg	Cadmium: 410 mg/kg
Copper: 1,630J mg/kg	Iron: 80,900J mg/kg
Lead: 19,800J mg/kg	Antimony: 72.7 mg/kg
Zinc: 73,500J mg/kg	
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
- Dog Creek was flowing directly through the site; surface water and sediment samples were collected upstream and downstream from the site. An observed release to Dog Creek was documented for iron. The chronic aquatic life criteria for lead was exceeded in the downstream sample, which was directly attributable to the site.
- No hazardous mine openings were identified at the site; however, the mill building was collapsing and potentially hazardous.

**Bald Butte Millsite PA# 25-179**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/18/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-179-SE-1	209 J	281 J	34.6	10.4	15.8	928 J	24400 J	6.26 J	8950 J	15.1	3390 J	34.7	4240 J	NR
25-179-SE-2	407 J	209 J	14.7	7.39	10.5	431 J	23100 J	1.39 J	7780 J	7.94	1570 J	13.3	2100 J	NR
25-179-TP-1	216 J	88.7 J	15.5	3.37	10.4	538 J	15500 J	17.5 J	731 J	9.64	1370 J	7.16 U	2470 J	NR
25-179-TP-2	191 J	63.4 J	14.9	2.45	8.34	581 J	11200 J	14.4 J	409 J	7.6	1110 J	6.86 U	1940 J	NR
25-179-TP-3	193 J	117 J	18.8	6.94	13.3	684 J	18000 J	0.596 J	1050 J	11.9	612 J	6.61 U	2280 J	NR
25-179-TP-4	202 J	97.7 J	14.9	5.51	19.4	852 J	16300 J	15 J	1130 J	10.5	2500 J	12.3	2750 J	NR
25-179-WR-1	11800 J	21.7 J	410.0	7.58	10.9	1630 J	80900 J	0.282 J	1670 J	10.5	19800 J	72.7	73500 J	NR
BACKGROUND	51.1 J	280 J	1.9	5.21	8.25	82.4 J	7590 J	0.109 J	2390 J	4.81	139 J	10.2 U	190 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000
25-179-TP-1	0.04	1.25	17.3	16.1	<0.01	<0.01	<0.01	0	0.05	0.05	0	17.3	17.3	17.3
25-179-TP-2	0.27	8.43	15	6.6	0.11	0.05	0.05	1.56	0.11	0.11	1.56	13.5	13.5	13.5
25-179-TP-3	0.07	2.19	8.43	6.24	0.03	0.01	0.01	0.31	0.03	0.03	0.31	8.12	8.12	8.12
25-179-TP-4	0.1	3.12	12.6	9.45	0.04	0.01	0.01	0.05	0.05	0.05	0.01	12.3	12.3	12.3
25-179-WR-1	7.12	222	183	-39	<0.01	4.23	4.23	132	6.84	6.84	132	51.2	51.2	51.2

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-179-SW-1	9.14	38	2.57 U	9.7 U	6.83 U	4.43 J	90.7	0.12 U	31.2	12.7 U	4.31 J	30.7 U	118 J	154
25-179-SW-2	24.3	34	2.57 U	9.7 U	6.83 U	6 J	283	0.12 U	102	12.7 U	7.08 J	30.7 U	71 J	134

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE	
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
25-179-SW-1	188	< 5.0	26	< 0.05	NR	NR	NR	NR	NR	NR
25-179-SW-2	172	< 5.0	21	< 0.05	NR	NR	NR	NR	NR	NR

**LEGEND**

- SE1 - Upgradient on Dog Creek, 30 feet from mill building
- SE2 - Downgradient on Dog Creek, 825 feet from breach.
- TP1 - Composite of subsamples TP1A-A, 1B-A, and 2A-B.
- TP2 - Composite of subsamples TP1B-B, 1B-C, 1D-C, and 1D-D.
- TP3 - Composite of subsamples TP1B-D, and 2B-B.
- TP4 - Composite of subsamples TP2A-A and 2B-A.
- WR1 - Sample of the WR1 subsample.
- BACKGROUND - From the Wild Cat Mine (25-317-SB-1).
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Wild Cat</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>11N</u> R <u>6W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 4</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 43' 49"</u>	Primary Drainage: <u>Little Prickly Pear Creek</u>
Longitude: <u>W 112° 22' 00"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Lost Horse Creek</u>
Quad: <u>Greenhorn Mountain</u>	Date Investigated: <u>August 18, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>25-317</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 2,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 455J to 895J mg/kg	Cadmium: 14 to 21 mg/kg
Copper: 813J to 1,080J mg/kg	Iron: 26,400J mg/kg
Mercury: 2.3J to 12.2J mg/kg	Manganese: 9,120J to 11,500J mg/kg
Lead: 2,580J to 3,330J mg/kg	Antimony: 79.7 to 103 mg/kg
Zinc: 3,190J to 5,310J mg/kg	
- The volume of waste rock associated with this site was estimated to be approximately 185 cubic yards. No samples were collected due to the relatively small volume.
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- Intermittent Lost Horse Creek (dry at the time of the investigation) was situated in the center of the site. Sediment samples were collected upstream and downstream from the site. Observed releases to Lost Horse Creek (sediment) were documented for arsenic, cadmium, copper, manganese, lead, and zinc.
- No hazardous mine openings were identified at the site.

Wild Cat PA# 25-317  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/31/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-317-SE-1	32.8 J	77.4 J	1.0	2.97	5.06	41.8 J	8640 J	0.398 J	664 J	6.59	117 J	9.28 U	191 J	0.518 U
25-317-SE-2	171 J	97.5 J	4.6	3.15	6.05	219 J	13300 J	0.916 J	2960 J	6.24	867 J	9.27	997 J	0.314 U
25-317-TP-1	455 J	92.5 J	14	4.7	7.99	813 J	16800 J	2.3 J	9120 J	2.89	2580 J	79.7	3190 J	0.278 U
25-317-TP-2	895 J	148 J	21	6.18	11.5	1080 J	26400 J	12.2 J	11500 J	3.99	3330 J	103	5310 J	0.348 U
BACKGROUND	51.1 J	290 J	1.9	5.21	8.25	82.4 J	7590 J	0.109 J	2390 J	4.81	139 J	10.2 U	190 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL	NEUTRAL. POTENTIAL	SULFUR ACID BASE POTENTIAL	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL	SULFUR ACID BASE POTENTIAL
25-317-TP-1	0.01	0.31	43.8	43.5	0.01	<0.01	<0.01	0	43.8
25-317-TP-2	0.01	0.31	50.1	49.8	0.01	<0.01	<0.01	0	50.1

LEGEND

SE1 - Upgradient in Lost Horse Creek  
SE2 - Downgradient in Lost Horse Creek  
TP1 - Composite of subsamples TP1, 2A-A, 2A-C, and 2B-A  
TP2 - Composite of subsamples TP2A-B and 2B-B  
BACKGROUND - West of creek. From Wild Cat Mine (25-317-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Goldsil Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>12N</u> R <u>5W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 33</u>
Mining District: <u>Marysville</u>	Mine Type: <u>Millsite/Au</u>
Latitude: <u>N 46° 45' 00"</u>	Primary Drainage: <u>Canyon Creek</u>
Longitude: <u>W 112° 14' 12"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Silver Creek</u>
Quad: <u>Silver City</u>	Date Investigated: <u>September 2, 1993</u>
Inspectors: <u>Bullock, M. Babits, S. Babits,</u>	P.A. # <u>25-365</u>
<u>Flammang, Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 700,000 cubic yards. The following elements are elevated at least three times background:

Arsenic: 84.5J mg/kg	Cadmium: 1 to 3 mg/kg
Copper: 160 to 379 mg/kg	Mercury: 0.69JX to 223J mg/kg
Lead: 205J to 537J mg/kg	Antimony: 10.8J to 66.9J mg/kg
Zinc: 400J to 1010JX mg/kg	Cyanide: 1.97 to 3.13 mg/kg
- There was no waste rock material associated with this site.
- Silver Creek paralleled this site for approximately 1 mile. No observed releases to Silver Creek were documented during this investigation. MCL/MCLGs and aquatic life criteria were not exceeded for this data set. Stream sediment data collected in Silver Creek indicated elevated levels of mercury.
- A variety of hazardous wastes were located in the mill structure, including acids, organic solvents, and other reagents.

Goldsil Millsite PA# 25-365  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/02/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-365-SE-1	66.6 J	83.3 J	1.0 U	4.26 J	5.27 J	31.8 JX	11400	0.69 JX	787	6.22 J	16.2	7 UJ	62.4 J	NR
25-365-SE-2	34.2 J	94 J	1.0 U	1.39 J	3.85 J	23.2 JX	6400	3.11 JX	480	3.14 J	12.2	7.06 UJ	64.1 J	NR
25-365-TP-1	41.2 J	51.7 J	2.0	2.35 J	6.07 J	197 JX	8470	81.4 JX	884	3.4 J	237	10.8 J	470 J	2.57
25-365-TP-2	37.1 J	52.5 J	2.0	1.97 J	4.92 J	187 JX	7620	46.4 JX	843	3.43 J	207	11.1 J	400 J	2.4
25-365-TP-3	13 J	58.6 J	1.0 U	3.48 J	6.54 J	53.1 JX	8480	5.42 JX	852	3.82 J	68.5	7.08 UJ	137 J	0.379 U
25-365-TP-4	34.9 J	74.8 J	2.0	4.9	18.6	198	11700 J	21.4 J	827	13 J	245 J	31.2 J	477 J	3.13
25-365-TP-5	84.5 J	117 J	3.5	5.96	15.3	379	18600 J	223 J	1430	14 J	537 J	66.9 J	1010 J	1.97
25-365-TP-6	36.6 J	59.9 J	3.4	4.35	7.86	160	9210 J	86 J	857	8.39 J	205 J	30.3 J	412 J	2.82
BACKGROUND	25 J	650	0.4 UJ	5.6	10.7	32.6	14700	0.187	662	14 J	28	3 UJ	75	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE V/1000	NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE V/1000	SULFUR ACID BASE POTENT. V/1000
25-365-TP-1	0.03	0.94	84.1	83.1	0.01	<0.01	0.02	0	84.1
25-365-TP-2	<0.01	0	68.5	68.5	<0.01	0.02	0.02	0.62	67.8
25-365-TP-3	<0.01	0	49.9	49.9	<0.01	<0.01	<0.01	0	49.9
25-365-TP-4	<0.01	0	78.5	78.5	<0.01	<0.01	0.02	0	78.5
25-365-TP-5	0.05	1.56	124	122	0.01	0.01	0.03	0.31	123
25-365-TP-6	0.22	6.87	82.9	76.1	0.09	0.03	0.1	0.94	82

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Reported

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
25-365-SW-1	5.29	82.7	4.59 U	5 U	6.24 U	2.33 U	123	0.12 U	21.8	10.9 U	1.13	31.7 U	8.71 U	212
25-365-SW-2	4.35	73.6	4.59 U	5 U	6.24 U	2.33 U	90.8	0.12 U	15.3	10.9 U	1.69	31.7 U	12.3	195
25-365-SW-3	2.56	68.4	4.59 U	5 U	6.24 U	2.33 U	93.3	0.12 U	16.9	10.9 U	1.53	31.7 U	12.4	181

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-365-SW-1	213	< 5	19	< 0.05	< 0.005
25-365-SW-2	212	< 5	18	0.06	< 0.005
25-365-SW-3	189	< 5	18	0.09	< 0.005
25-365-SW-5	NR	NR	NR	NR	< 0.005

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Reported

LEGEND

- SE1 - At toe of berm with flow gate in Silver Creek.  
SE2 - At culvert (downgradient) at road.  
TP1 - Composite of subsamples TP1A-A through 1A-C and 1B-A through 1B-E.  
TP2 - Composite TP1D-A, B, and C.  
TP3 - Sample of the TP1C subsample (Argo Mill Tailings).  
TP4 - Composite of subsamples TP2A-A, B, C, and 2B.  
TP5 - Composite of subsamples TP3A-A and 3A-B.  
TP6 - Composite of subsamples TP4A-A and 4A-B.
- BACKGROUND - From the Big Ox Mine (25-116-SS-1).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Upgradient (200') from mill building (Argo) in Silver Creek.  
SW5 - Pregnant pond below mill.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Victory/Evening Star</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>11N</u> R <u>7W</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 17</u>
Mining District: <u>Ophir</u>	Mine Type: <u>Hardrock/Au, Ag, Cu</u>
Latitude: <u>N 46° 42' 20"</u>	Primary Drainage: <u>Carpenter Creek</u>
Longitude: <u>W 112° 30' 27"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Ophir Creek</u>
Quad: <u>Ophir Creek</u>	Date Investigated: <u>July 15, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>25-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 700 cubic yards. The tailings were very shallow and completely revegetated. The following elements were elevated at least three times background:  
Arsenic: 566 mg/kg                      Copper: 5590 mg/kg  
Iron: 95,600 mg/kg                      Mercury: 6.07 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 8300 cubic yards. The following elements were elevated at least three times background:  
Copper: 1050 mg/kg  
Mercury: 1.08 mg/kg
- There were no discharging adits or shafts associated with this site.
- Ophir Creek flowed intermittently below this site. The stream channel had been heavily placered and the water flow was often subsurface below the placer tailings piles in the vicinity of this site. No observed releases to surface water were documented during this investigation. No MCL/MCLGs were exceeded and no aquatic life criteria were exceeded. The stream sediment samples collected documented observed releases of arsenic, copper, and mercury, attributable to this site.
- There were no significant hazardous structures or mine openings associated with this site.

Victory/Evening Star PA# 25-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-010-SE-1	36 J	52.9	1.9 U	7.1 U	11.2	490 JX	15200	2.91 J	129	9 UJX	31 J	22 UJ	57 J	NR
25-010-SE-2	6 U	72.9	0.7 U	7	13.2	28	10300	0.137	186	17	14	8 UJ	32	NR
25-010-TP-1	566	236	5.2	16.5	38.9	5590	95600	6.07	1060	21	23	15 J	143	NR
25-010-WR-1	163	164	1.9	14.3	42.4	1050	29900	1.08	469	40	8	5 UJ	36	NR
BACKGROUND	71	312	5.6	13	18	224	15800	0.296	1570	15	156	9 UJ	240	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000x	NEUTRAL POTENT. 1/1000x	SULFUR ACID BASE POTENT. 1/1000x	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000x	PYRITIC SULFUR ACID BASE POTENT. 1/1000x
25-010-TP-1	0.12	3.75	132	128	0.02	0.31	132
25-010-WR-1DUP	1.63	50.9	456	405	1.62	30.3	426
25-010-WR-1	1.61	50.3	464	414	1.54	42.8	422

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-010-SW-1	1.61 J	19.60	2.57 U	9.70 U	6.83 U	3.57	11.8 U	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	244
25-010-SW-2	2.11 J	18.90	2.57 U	9.70 U	6.83 U	1.55 U	11.8 U	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	246

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-010-SW-1	255	< 5.0	9	< 0.05	< 0.01
25-010-SW-2	256	< 5.0	8	< 0.05	< 0.01

LEGEND

- SE1 - Downgradient approx. 100' from last tailings pile.  
SE2 - Upgradient of site approx. 100'.  
TP1 - Composite of subsamples TP1A-A, 1B-A, and 1C-A.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.  
BACKGROUND - From the Victory/Evening Star (25-010-SS-1).  
WR1DUP - Duplicates of the 25-010-WR-1 sample.
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Tenmile Mine</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 5</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 46° 28' 20"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 14' 30"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>July 15, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>25-005</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 3,040 cubic yards (not including three reclaimed dumps located in the lower section of the site). The following elements were elevated at least three times background:  
Arsenic: 1,990 to 5,530 mg/kg      Lead: 2,390 to 3,220 mg/kg  
Cadmium: 14.3 mg/kg              Zinc: 631 to 989 mg/kg  
Copper: 136 to 231 mg/kg        Mercury: 0.231 to 0.634 mg/kg
- Two adit discharges were associated with this site, a minute discharge from Adit #1 disappeared into WR-1 but did not re-emerge and was not sampled for laboratory analyses. The minor discharge from adit #5 (two gpm) exceeded the MCL for arsenic and cadmium. Acute aquatic life criteria were exceeded for cadmium and zinc and chronic aquatic life criteria were exceeded for cadmium, lead, and zinc in the Adit #5 discharge. Adit discharge pH measurements were 8.39 and 6.29 for Adit #5 and Adit #1, respectively.
- The toe of one of the reclaimed dumps was located within the Tenmile Creek floodplain.
- Logs, from a wooden ore loadout bin, were leaning downhill and may be potentially hazardous; also, WR-1 was very steep and was considered unstable. The caved upper adit (#1) blew out after this investigation.

Tenmile PA# 25-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-005-WR-1	1990	17.6	5	5.1	2.8	231	19900	0.634	437	3	2390	37 J	631	NR
25-005-WR-2	5530	69.6	14.3	10.6	3.4	136	32000	0.231	2220	2 U	3220	10 J	989	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	%	%	%	1/1000	1/1000	POTENT.	1/1000
25-005-WR-1	0.17	5.31	0.34	4.97	0.17	<0.01	0.01	0.01	0.14	0.13	0	3.12	-2.9	-1.81
25-005-WR-2DUP	0.48	15	0.22	-15	0.24	0.1	0.14	0.14	0.13	0.13	3.12	2.19	-2.9	-1.81
25-005-WR-2	0.47	14.7	0.38	-14	0.27	0.07	0.13	0.13	0.13	0.13	2.19	2.19	-1.81	-1.81

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.
25-005-GW-1	92.7 J	3.70	10.20 J	9.70 U	6.83 U	10.70	297	0.038 U	858	12.7 U	13 J	30.7 U	2050	209

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-005-GW-1	335	< 5.0	157	0.39	NR

LEGEND

WR1 - Composite of subsamples WR1A through 1C.  
WR2 - Composite of subsamples WR3A, 3B, and 4.  
BACKGROUND - From the Red Water Mine (25-007-SB-1).  
WR2DUP - Duplicates of sample 25-005-WR-2.

GW1 - Add #5 discharge.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Peerless Jenny/King</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>8N</u> R <u>5W</u>	Section(s): <u>SE 1/4, NW 1/4, Section 21</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 46° 25' 54.7"</u>	Primary Drainage: <u>Banner Creek</u>
Longitude: <u>W 112° 14' 20.9"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Banner Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>July 26, 1994</u>
Inspectors: <u>Tuesday, Clark, West</u>	P.A. # <u>25-006</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock associated with this site was estimated to be 28,030 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 25.2JX to 44.7JX mg/kg	Mercury: 0.18 to 0.84 mg/kg
Arsenic: 65.2J to 91.3J mg/kg	Lead: 431 to 1,150 mg/kg
Copper: 103 to 291 mg/kg	Zinc: 1,050 mg/kg
- Two discharging adits and numerous springs were associated with the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper, and zinc were exceeded in the Adit #2 discharge. The acute aquatic life criteria for silver and the chronic aquatic life criteria for lead were exceeded in the Adit #1 discharge.
- The adit discharges combined to form the flow in a intermittent drainage which ran through the center of the site. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for lead were exceeded in the drainage downstream from the site.
- Potential safety hazards observed at the site included two large, collapsing cabins/bunkhouses.

Peerless Jenny/King PA# 25-006  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/28/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-006-SE1	2.1	21.6	101	0.8	5.2	4.0	33.0	19700	0.03 UJX	536	3.7	48.6 J	9.4 UJ	52.4	NR
25-006-SE2	13.9	23.0	29.6	0.9	2.9	2.0	112	10100	0.03 UJX	693	3.0 U	401 J	10.9 UJ	209	NR
25-006-SE3	22.3 JX	32.2 J	62.0	5.1	6.2	1.6 U	310	15300	0.03	1240	3.5 U	544	12.4 UJ	528	NR
25-006-WR1	44.7 JX	91.3 J	26.1	1.5	2.0	1.1 U	291	21800	0.18	456	2.3 U	1150	8.2 UJ	302	NR
25-006-WR2	25.2 JX	65.2 J	93.3	8.4	5.8	1.4 U	103	18800	0.84	689	5.7	431	10.8 UJ	1050	NR
25-262-SE4	1 U	7.8 U	35	1.1	3.6	2.0	25.8	3870	0.03 JX	934	3.4 U	23.9 J	12.0 UJ	191	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
25-006-WR1	0.17	5.31	-0.89	-6.2	0.15	0.31	0.01	0.01	0.01	0.00	-1.21	-1.21
25-006-WR2	0.34	10.6	1.51	-9.1	0.25	0.09	<0.01	0.09	0.09	0.00	1.51	1.51

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-006-AD1	0.55	3.0	27.7	4.0 UJX	8.4 U	6.8 U	5.9 U	33.2	0.08 U	3.1	14.4 U	3.2 J	51.6 U	15.6 U	18.9 B
25-006-AD2	0.22	4.9	26.6	10.4 JX	8.4 U	6.8 U	104	1090	0.08 U	4810	14.4 U	11.7 J	51.6 U	1230 J	129
25-006-SW2	1.85	1.9	37.7	33.1 JX	8.4 U	6.8 U	349	61.2	0.08 U	3540	14.4 U	47.1 J	51.6 U	3510 J	26.4 B
25-006-SW3	0.30	3.8	27.5	4.2 JX	8.4 U	6.8 U	19.6	38.3	0.08 U	680	14.4 U	3.3 J	51.6 U	867 J	88.0
25-262-SW4	0.13	3.2	25.9	4.0 UJX	8.4 U	6.8 U	5.9 U	268	0.08 U	351	14.4 U	3.8 J	51.6 U	164 J	47.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-006-AD1	46	<5	9.0	0.06	NR
25-006-AD2	181	<5	99	0.06	NR
25-006-SW2	99	<5	40	0.06	NR
25-006-SW3	133	<5	71	0.06	NR
25-262-SW4	84	<5	31	0.06	NR

LEGEND

- SE1 - Upstream of WR1 in dry drainage.
- SE2 - Downstream of WR1 in drainage, upstream of WR2.
- SE3 - Downstream of WR2 in drainage.
- 25-262-SE4 - From the Quarry/Precious King Mine, below Precious drainage.
- WR1 - Composite of sub-samples WR1A through 1D.
- WR2 - Composite of sub-samples WR2A through 2E.
- BACKGROUND - From the Precious Jenny/King Mine (25-006-SE1).
- AD1 - Upper soil at the Precious Jenny.
- AD2 - Lower soil at the Precious Jenny.
- SW2 - Same as sample 25-006-SE2.
- SW3 - Same as sample 25-006-SE3.
- 25-262-SW4 - Same as sample 25-262-SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Red Water</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>NW 1/4, Sec. 4</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 46° 28' 30"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 14' 42"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>July 13, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>25-007</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 7000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 4010J to 8260J mg/kg	Copper: 79.6J to 96J mg/kg
Mercury: 0.327 to 0.499 mg/kg	Lead: 2140J to 2290J mg/kg
Antimony: 43J mg/kg	Zinc: 678 mg/kg
- There was one adit discharge associated with this site. The discharge flowed at approximately 29 gpm across WR-1 and then flowed into Tenmile Creek. The discharge pH was measured at 6.79 and the specific conductance was 203 umhos/cm. The adit discharge sample exceeded MCL/MCLGs for arsenic, cadmium, and antimony. The sample exceeded acute aquatic life criteria for cadmium and zinc, and chronic aquatic life criteria for cadmium, lead, and zinc.
- There was an occupied residence on the north end of this site. A sample of the residence's domestic water supply well did not exceed any of the MCLs or MCLGs.
- Tenmile Creek flowed along the base of the waste rock dumps, approximately 200 yards above a City of Helena drinking water supply intake. Surface water samples collected did not document any observed releases to the creek. There were no MCLs or MCLGs exceeded at the time of this sampling. No aquatic life criteria were exceeded that could be directly attributed to this site. The stream sediment samples collected in Tenmile Creek did document an observed release of lead.
- The discharging adit was an HMO.

Red Water PA# 25-007  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/13/83

SOLID MATRIX ANALYSES

Metals in soils														
Results per dry weight basis														
FIELD	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-007-SE-1	350 J	43.6	5	6.4	3.6 J	31.3 J	9230	0.141	895	6 J	254 J	7 UJ	441	NR
25-007-SE-2	167 J	21.6	2.6	4.8	1.3 U	11.1 J	5390	0.079	478	3 J	54 J	6 UJ	205	NR
25-007-WR-1	8260 J	16	5.5	3.3	1.2 U	96 J	17200	0.327	669	4 J	2140 J	43 J	678	NR
25-007-WR-2	4010 J	36.6	3.5	4.4	1.2 J	79.6 J	22400	0.499	661	4 J	2290 J	17 J	463	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	ACID BASE	SULFATE	SULFUR	SULFATE	SULFUR	ACID BASE	POTENT.
	%	1/1000	1/1000	1/1000	%	%	%	%	1/1000	1/1000
25-007-WR-1	0.95	29.7	9.27	-20	0.45	0.17	0.33	0.33	5.31	3.96
25-007-WR-2	0.57	17.8	2.2	-16	0.33	0.05	0.19	0.19	1.56	0.64

WATER MATRIX ANALYSES

Metals in Water Results in ug/L													
FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
25-007-GW-1	131	41.00	73.90	13.80	6.83 U	16.00	6160	0.038 U	6250 J	12.7 U	1.02 J	33.1	14100 J
25-007-GW-2	14.3	46.90	2.57 U	9.70 U	6.83 U	49.30	11.8 U	0.073	15 J	12.7 U	0.72 U	30.7 U	11 J
25-007-GW-3	12.62 J	39.80	2.57 U	9.70 U	6.83 U	49.40	20.8 JX	0.038 U	23.7	12.7 U	3.71	30.7 U	20.1 J
25-007-SW-1	3.89 J	11.40	2.57 U	9.70 U	6.83 U	11.80	321 JX	0.160	64.4	12.7 U	6.3	30.7 U	201 J
25-007-SW-2	3.95 J	11.00	2.90 J	9.70 U	6.83 U	11.30	242 JX	0.160	48.5	12.7 U	3.4	30.7 U	157 J

HARDNESS  
CALC.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE	
	DISSOLVED	SOLIDS	<	<	<	<	<	<	<	<
25-007-GW-1	315	<	5.0	<	199	<	0.05	<	NR	<
25-007-GW-2	199	<	5.0	<	50	<	0.05	<	NR	<
25-007-GW-3	186	<	5.0	<	50	<	0.05	<	NR	<
25-007-SW-1	69	<	5.0	<	7	<	0.05	<	NR	<
25-007-SW-2	60	<	5.0	<	7	<	0.05	<	NR	<

LEGEND

SE1 - Downgradient of site, just across from house and shed.  
SE2 - Approx. 25' upgradient of SE end of waste rock dump 1.  
WR1 - Composite of subsamples WR1A through 1E.  
WR2 - Composite of subsamples WR2A, 2B, and 2C.  
BACKGROUND - From the Red Water Mine (25-007-SS-1).  
GW1 - Discharge from the mouth of acid #1.  
GW2 - Residential well, 400' downgradient from site.  
GW3 - QA/QC duplicate of 25-007-GW-2.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Valley Forge/Susie</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 9N R 5W</u>	Section(s): <u>NW 1/4, S 1/2, Sec. 33</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 46° 29' 40"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 14' 04"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>July 13, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>25-008</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- This site was located in the town of Rimini.
- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 6900 cubic yards. WR-1, the upper dump constitutes approximately 1100 cubic yards of the total volume. WR-1 was reclaimed under the MDSL Abandoned Mine Reclamation Program. WR-2 was partially covered by residential lawns and was bordered by Tenmile Creek. The following elements ere elevated at least three times background:

Arsenic: 21,500J mg/kg	Copper: 167J mg/kg
Mercury: 0.886 mg/kg	Lead: 9870J mg/kg
Antimony: 71J mg/kg	Zinc: 757 mg/kg
- A seep emanated from the base of WR-1 and flowed along the side of WR-2 prior to discharging into Tenmile Creek. This seep was probably an adit discharge. Perforated pipe was installed in the seep area as part of the reclamation project to concentrate the flow. At the time of this investigation, the seep was flowing at approximately 20 gpm with a pH of 5.70 and a specific conductance of 379 umhos/cm. A sample collected at the discharge of the pipe exceeded MCL/MCLGs for arsenic, cadmium, and antimony, as well as acute aquatic life criteria for arsenic, iron, cadmium, and zinc, and chronic aquatic life criteria for arsenic, cadmium, mercury, and zinc.
- There was one domestic water supply well within 100 feet of WR-1. Although the water in this well exhibited a low pH (5.31) and alkalinity (0 mg/l), the sample did not exceed any of the MCLs or MCLGs.
- This site was below the City of Helena drinking water intake. An observed release of arsenic was documented and directly attributable to this site. The MCL/MCLG for cadmium was exceeded and also was attributable to this site. Although Tenmile Creek did exceed several acute and chronic aquatic life criteria, none could be attributed to this site.

Valley Forge/ Susle PA# 25-008  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/13/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-008-SE-1	212 J	42.5	5.3	7.6	6.3 J	28.1 J	13900	0.024	1040	6 J	181 J	9 UJ	301	NR
25-008-SE-2	151 J	18.8	2.6	5	3.2 J	14.1 J	5480	0.036	619	3 J	158 J	6 UJ	220	NR
25-008-WR-1	21500 J	103	5.1	5.2	2.8 J	167 J	35000	0.886	711	6 J	9870 J	71 J	757	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000	NEUTRAL POTENT v/1000	SULFUR ACID BASE POTENT v/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT v/1000
25-008-WR-1	1.04	32.5	96.2	63.7	0.26	0.2	6.25

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-008-GW-1	27700 J	2.01 U	91.80 J	64.90	10.20	33.80	171000 JX	0.150	14500	43.6	13.2	53.6	27200 J	921
25-008-GW-2	6.72 J	54.00	2.57 U	9.70 U	6.83 U	11.00	491 JX	0.038 U	31.4	12.7 U	8.98	30.7 U	20.9 J	250
25-008-SW-1	40.74 J	10.00	5.17 J	9.70 U	6.83 U	12.60	425 JX	0.140	79.5	12.7 U	4.87	30.7 U	277 J	17.9
25-008-SW-2	5.61 J	10.60	4.30 J	9.70 U	6.83 U	12.70	233 JX	0.120	64.4	12.7 U	4.55	30.7 U	248 J	17.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-008-GW-1	2010	< 5.0	1170	< 0.05	NR
25-008-GW-2	1020	< 5.0	575	1.4	NR
25-008-SW-1	64	< 5.0	11	< 0.05	NR
25-008-SW-2	76	< 5.0	11	< 0.05	NR

LEGEND

SE1 - About 25' below confluence with seep in Tennille Creek.  
SE2 - Upstream of bridge on Tennille Creek;  
25' upstream of waste rock dump 2.  
WR1 - Composite of subsamples WR 2A and 2B.  
BACKGROUND - From Red Water Mine (25-007-SB-1).

GW1 - From mouth of pipe at base of waste rock dump 1.  
GW2 - Residential well; 100' North (downgradient).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Red Mountain</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>8N</u> R <u>5W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 4; NE 1/4, SW</u>
Mining District: <u>Rimini</u>	<u>1/4, Sec. 4</u>
Latitude: <u>N 46° 28' 15"</u>	Mine Type: <u>Hardrock/Pb, Zn, Cu, Ag, Au</u>
Longitude: <u>W 112° 13' 15"</u>	Primary Drainage: <u>Tenmile Creek</u>
Land Status: <u>Private</u>	USGS Code: <u>10030101</u>
Quad: <u>Chessman Reservoir</u>	Secondary Drainage: <u>Tenmile Creek</u>
Inspectors: <u>Bullock, Belanger, Pierson</u>	Date Investigated: <u>August 19 and 20, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>25-019</u>
<u>/Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 13,300 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3900 to 19,000 mg/kg	Mercury: 0.421 to 1.16 mg/kg
Lead: 2790 to 7860 mg/kg	Antimony: 33 to 164 mg/kg
Zinc: 373 to 489 mg/kg	
- The only potential adit discharge was a seep at the toe of WR-1 that discharges into the man-made flume. The flume supplied water to Chessman reservoir. This seep was discharging at a flow of less than 1 gpm, a pH of 6.67, and a specific conductance of 190 umhos/cm. The sample of this discharge exceeded the MCL for arsenic as well as the acute and chronic aquatic life criteria for cadmium, copper, lead, and zinc.
- A small intermittent tributary to Tenmile Creek contacted several of the waste rock dumps. Observed releases were documented for arsenic, lead, and zinc. No MCL/MCLGs were exceeded that were directly attributed to this site. The acute aquatic life criteria was exceeded for copper and could be directly attributed to this site.
- A water supply flume for the Chessman Reservoir crossed this site. Waste rock from WR-5 and WR-1 sluff or erode into this flume and introduced into the water supply.
- There was one open shaft that was an HMO and one hazardous structure associated with this site.

Red Mountain (13) PA# 25-019  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/19/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-019-SE-1	54.5	36.6	1.0 UJ	9.52 J	2.53 J	28.9	8480	0.04 U	1020	7.74 J	62.9	6.73 U	175	NR
25-019-SE-2	67.4	14.1	1.1 UJ	2.33 J	1.46 U	2.56	3300	0.032 U	312	2.56 U	80.8	7.42 U	50.5	NR
25-019-SE-5	5550	13.1	1.0 UJ	1.6 J	1.41 U	119	14000	0.157	176	2.46 U	2330	47.2	194	NR
25-019-SE-6	84.1	21.7	1.0 UJ	2.3 J	1.36 U	4.65	4420	0.058	691	2.37 U	129	6.88 U	73.3	NR
25-019-WR-1	3900	9.22	1.0 UJ	1.17 J	1.31 U	77.5	15400	0.421	49.4	2.3 U	2790	33	192	NR
25-019-WR-2	19000	39.4	0.9 UJ	1.66 J	1.28 U	23.2	20200	1.16	18.5	2.24 U	4080	55.2	189	NR
25-019-WR-3	7010	29.1	0.8 UJ	3.08 J	1.27 J	136	17900	0.84	762	3.17 J	6120	164	489	NR
25-019-WR-4	4190	19	0.7 UJ	0.82 J	0.98 U	304	14000	0.572	33.1	1.71 U	7960	93.8	373	NR
BACKGROUND	103	63.4	0.8 UJ	6.86 J	4.35 J	15.4	9030	0.047	1610	6.69 J	258	9.78	117	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL v/1000r	NEUTRAL POTENTIAL v/1000r	SULFUR ACID BASE POTENTIAL v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENTIAL v/1000r	ACID BASE POTENTIAL v/1000r
25-019-WR-1	0.25	7.81	-0.7	-8.5	0.01	<0.01	0	-0.67
25-019-WR-2	1.92	60	-3.6	-64	0.4	0.92	28.7	-32.3
25-019-WR-3	0.56	17.5	-1.4	-19	0.18	0.04	1.25	-2.63
25-019-WR-4	0.62	19.4	-2.7	-22	0.13	0.02	0.62	-3.34

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-019-GW-1	71.2	2.27	3.63	9.7 U	6.83 U	14.2 J	489	0.12 U	1020	16.5 J	52.6 J	30.7 U	1470 J	44.4
25-019-SW-1	11.8	3.2	2.57 U	9.7 U	6.83 U	1.55 U	165	0.12 U	20.9	12.7 U	3.36 J	30.7 U	23.2 J	9
25-019-SW-2	13	2.9	2.57 U	9.7 U	6.83 U	1.55 U	159	0.12 U	4.73	12.7 U	2.39 J	30.7 U	18.6 J	7.8
25-019-SW-3	45.8	5.33	15.4	9.7 U	6.83 U	1.99 J	1210	0.23 J	1230	21.8 J	58.2 J	30.7 U	2700 J	27
25-019-SW-4	3.66	4.27	2.57 U	9.7 U	6.83 U	1.63 J	223	0.2 J	7.57	12.7 U	3.49 J	30.7 U	23.2 J	8

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-019-GW-1	19	< 5.0	40	< 0.05	NR
25-019-SW-1	56	< 5.0	5	< 0.05	NR
25-019-SW-2	48	< 5.0	< 5	< 0.05	NR
25-019-SW-3	116	< 5.0	53	0.2	NR
25-019-SW-4	45	< 5.0	< 5.0	0.51	NR

LEGEND

SE1 - Downgradient of waste rock dump 1, 2, and 3.

SE2 - Upgradient of waste rock dumps 1, 2, and 3.

SE3 - Downgradient with sample SW3.

SE6 - Upgradient with sample SW4.

WR1 - Composite of subsamples WR1, 2A, and 2B.

WR2 - Sample of the WR3 subsample.

WR3 - Composite of the subsamples WR4A, 4B, 5, 6A, and 6B.

WR4 - Composite of the subsamples WR7A, 7B, 7C, 8A, and 8B.

BACKGROUND - From the Red Mountain Mine (25-019-SB-1).

GW1 - Seepage from waste rock dump 1.

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW3 - Downgradient at Red Mountain N.

SW4 - Upgradient, above aqueduct at Red Mountain N.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lower Tenmile</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>9N</u> R <u>5W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 3</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 33' 52"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 13' 13"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Black Mountain</u>	Date Investigated: <u>July 15, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>25-030</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site could not be accurately determined during the investigation because the area has been completely revegetated. The volume was grossly estimated at 13,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3,470 mg/kg	Mercury: 0.242 mg/kg
Cadmium: 10.6 mg/kg	Lead: 2,410 mg/kg
Copper: 21J mg/kg	Zinc: 654 mg/kg
- No MCL/MCLG exceedances were observed in groundwater or surface water samples collected at this site. Surface water, which flowed directly through the reclaimed tailings area, exceeded acute water quality criteria for copper and zinc in both upstream and downstream sample. Chronic water quality criteria were exceeded for copper, lead, and zinc in both upstream and downstream samples, indicated the presence of an upstream contaminant source.
- An observed release to surface water was documented for lead and arsenic in sediment; however, the concentration of arsenic in the surface water did not exceed any established standards. The chronic water quality criteria was exceeded for lead in both upstream and downstream samples. An observed release to groundwater was documented for zinc; however, the concentration of zinc in the groundwater did not exceed any established standards.
- Residences were located on the reclaimed tailings.

Lower Tenmile PA# 25-030  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 7/15/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-030-SE-1	111	39.3	4.9	7.2	3.8	53.5	8170	0.141	801	3 U	94	7 UJ	488	NR
25-030-SE-2	715	87.9	3.7	4.8	2.9	30.2	7120	0.111	837	2 U	258	5 UJ	399	NR
25-030-TP-1	3470	27.1	10.6	3.8	2.8	88.3	12300	0.242	313	3 U	2410	17 J	654	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. %	3.08
25-030-TP-1	0.07	2.19	3.39	1.2	0.05	0.01	0.31	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-030-GW-1	25.5 J	2.80	2.57 U	9.70 U	6.83 U	24.80	92	0.038 U	4.08 U	12.7 U	0.86 J	30.7 U	7.57 U	60.6
25-030-GW-2	5.30 J	14.50	2.57 U	9.70 U	6.83 U	1.55 U	765	0.038 U	70.4	12.7 U	0.75 J	30.7 U	82.9	90.5
25-030-SW-1	16.5 J	13.50	2.57 U	9.70 U	6.83 U	5.33	205	0.038 U	4.08 U	12.7 U	2.07 J	30.7 U	126	26.4
25-030-SW-2	20.4 J	13.10	2.57 U	9.70 U	6.83 U	5.33	199	0.038 U	4.08 U	12.7 U	6.15 J	30.7 U	163	27.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	TOTAL CYANIDE
25-030-GW-1	222	< 5.0	46	< 0.05	NR
25-030-GW-2	285	9.3	50	< 0.05	NR
25-030-SW-1	72	< 5.0	11	< 0.05	NR
25-030-SW-2	79	< 5.0	11	< 0.05	NR

LEGEND

- SE1 - Upgradient of tailings.  
SE2 - Downgradient of tailings.  
TP1 - Composite of subsamples TP1A and 1B.  
BACKGROUND - From the Red Water Mine (25-007-SS-1).
- GW1 - Residential well, upgradient.  
GW2 - Residential well used for irrigation, downgradient.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Armstrong</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>8N</u> R <u>5W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 6</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Pb, Ag</u>
Latitude: <u>N 46° 28' 50"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 17' 13"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Minnehaha Creek</u>
Quad: <u>Three Brothers</u>	Date: <u>July 15, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>25-102</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 15,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1750 to 2670 mg/kg	Copper: 300 to 470 mg/kg
Mercury: 0.422J to 0.527J mg/kg	Lead: 14,000 to 15,900 mg/kg
Antimony: 41 to 43 mg/kg	Zinc: 614 to 724 mg/kg
- There was one adit discharge associated with this site. Field parameter measurements indicated unimpaired water quality.
- Minnehaha Creek was located in the drainage approximately 300 feet below the lower mine workings. No water samples were collected because of the distance from the site and lack of surface water runoff. Sampling during early spring snow melt/runoff events could possibly document impacts to the creek. XRF screening of stream sediments indicated no impacts to the creek attributable to this site.
- There was one hazardous mine opening, the upper adit, and five hazardous structures associated with this site. There was one residence on site that appeared to be used occasionally for recreational use.

Armstrong PA# 25-102  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/15/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-102-WR-1	1750	31.3	2	3.5	4.3	470	27700 J	0.527 J	339 J	3 U	15900	43	614	NR
25-102-WR-2	2670	26.5	3	2.1 U	4.1	300	30200 J	0.422 J	181 J	3 U	14000	41	724	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	TOTAL SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	POTENT. v/1000	NEUTRAL. v/1000	SULFUR %	ACID BASE v/1000	SULFUR %	SULFATE v/1000	SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	POTENT. v/1000	
25-102-WR-1	1.1	34.4			-2.2	-2.2		-37	0.94		0.04	1.25	0.12				-3.43	
25-102-WR-2DUP	1.12	35			-1.3	-1.3		-36	0.77		0.1	3.12	0.25				-4.4	
25-102-WR-2	1.1	34.4			-1.4	-1.4		-36	0.72		0.09	2.81	0.29				-4.22	

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
WR2 - Composite of subsamples WR3A, 3B, 4A, and 4B.  
BACKGROUND - From the Red Water (25-007-SS-1).  
WR2DUP - Duplicate of sample 25-102-WR-2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Beatrice</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 1</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 28' 53"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 18' 10"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Minnehaha Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 13, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>25-103</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 5,185 cubic yards. The following elements were elevated at least three times background:

Copper: 95.8JX to 342JX mg/kg	Lead: 600J to 2230J mg/kg
Mercury: 0.265J to 0.997J mg/kg	Antimony: 65J mg/kg
- Three of the adits had minor discharges which, when combined, made up the majority of the flow in an unnamed tributary to Minnehaha Creek. No MCL/MCLG exceedances were observed. Acute aquatic life criteria were exceeded for iron, mercury, cadmium, copper, lead, and zinc; however, acute aquatic life criteria were exceeded for mercury, copper, and zinc in the upstream sample also. Chronic aquatic life criteria were exceeded for cadmium, copper, and zinc; however, chronic aquatic life criteria were exceeded for copper and zinc in the upstream sample. Adit discharge pH measurements were 4.34, 6.51, and 5.06 for Adit #1, Adit #2 and Adit #3, respectively. pH measurements for WR-1 seepage and WR-2 seepage were 3.81 and 6.11, respectively.
- The unnamed tributary to Minnehaha Creek cut directly through the toes of WR-1 and WR-2. This caused high turbidity and stained the streambed red. Observed releases to surface water were documented for copper and lead. Chronic aquatic life criteria exceedances for lead were attributed to the site; the exceedance for lead persisted in the sample collected farthest downstream (SW-5).
- The open shaft and open adit were accessible and potentially hazardous.

Beatrice PA# 25-103  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/13/83

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-103-SE-1	11 J	30.2	1 J	5.4	4.3	64 JX	9330	0.066 J	608	19 JX	14 J	7 UJ	76 J	NR
25-103-SE-3	33 J	22.5	2 J	8.6	3.2	207 JX	26500	0.095 J	816	9 JX	239 J	14 J	61 J	NR
25-103-SE-4	26 J	25.7	2 J	16.7	2.6	242 JX	24300	0.176 J	1430	3 UJX	183 J	8 UJ	68 J	NR
25-103-SE-5	25 J	11.4	2.4 J	5.4	3.3	127 JX	23400	0.084 J	372	5 JX	340 J	9 J	200 J	NR
25-103-WR-1	44 J	31.3	0.7 J	3.1	3.6	50.2 JX	20000	0.105 J	88.3	3 UJX	247 J	7 UJ	28 J	NR
25-103-WR-2	41 J	10.1	0.7 J	2 U	1.4 U	95.8 JX	16700	0.265 J	86.3	3 UJX	2230 J	14 J	55 J	NR
25-103-WR-3	95 J	17.7	2.8 J	4.6	2.6	342 JX	39100	0.997 J	282	5 JX	600 J	65 J	175 J	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. V/1000	SULFUR ACID BASE POTENT. V/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. V/1000	PYRITIC ACID BASE POTENT. V/1000
25-103-WR-1	0.31	9.68	-0.9	-11	0.1	0.02	0.62	-1.49
25-103-WR-2	0.89	27.8	-1.8	-30	0.3	0.08	2.5	-4.34
25-103-WR-3	0.21	6.56	-0.8	-7.4	0.08	<0.01	0	-0.84

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-103-SW-1	2.99	8.43	2.57 U	9.70 U	6.83 U	9.20	40.1	0.120	7.57 J	12.7 U	0.72 U	30.7 U	23.4 J	13.1
25-103-SW-2	1.80	8.20	2.57 U	9.70 U	6.83 U	121	1970	0.140	307 J	12.7 U	10.4 J	30.7 U	95.5 J	28.8
25-103-SW-3	1.73	7.33	3.07	9.70 U	6.83 U	175	2710	0.170	464 J	12.7 U	10.8 J	30.7 U	119 J	40.9
25-103-SW-4	1.46	7.20	2.57 U	9.70 U	6.83 U	156	2100	0.180	388 J	12.7 U	7.85 J	30.7 U	107 J	41.3
25-103-SW-5	2.13	8.63	2.57 U	9.70 U	6.83 U	14.40	139	0.170	14.1 J	12.7 U	6.16 J	30.7 U	16.3 J	13.8

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-103-SW-1	66	< 5.0	12	< 0.05	NR
25-103-SW-2	113	< 5.0	50	< 0.05	NR
25-103-SW-3	114	< 5.0	52	< 0.05	NR
25-103-SW-4	115	< 5.0	51	< 0.05	NR
25-103-SW-5	64	< 5.0	12	< 0.05	NR

LEGEND

- SE1 - Upgradient of all dump and discharges.
- SE3 - Downstream of waste rock dump 1 and edit #1.
- SE4 - Downstream of waste rock dump 2 and edit #2.
- SE5 - Upstream from edit #1, down from waste rock dump 4 and 5.
- WR1 - Composite of subsamples WR1A through 1C.
- WR2 - Composite of subsamples WR2A and 2B.
- WR3 - Composite of subsamples WR4A through 4C.
- BACKGROUND - From the Red Water Mine (25-007-SB-1).
- SW1 - Same as sample SE1.
- SW2 - Discharge from edit #1.
- SW3 - Same as sample SE3.
- SW4 - Same as sample SE4.
- SW5 - Same as sample SE5.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Woodrow Wilson</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>SW 1/4, SW 1/4, SW 1/4</u>
Mining District: <u>Rimini</u>	Section <u>20</u>
Latitude: <u>N 46° 24' 51"</u>	Mine Type: <u>Hardrock/Au. Ag</u>
Longitude: <u>W 112° 15' 22"</u>	Primary Drainage: <u>Banner Creek</u>
Land Status: <u>Private</u>	USGS Code: <u>10030101</u>
Quad: <u>Three Brothers</u>	Secondary Drainage: <u>West Fork Banner Creek</u>
Inspectors: <u>Tuesday, Clark, West</u>	Date Investigated: <u>July 28, 1994</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>25-258</u>

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 1,085 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 6.5JX mg/kg	Arsenic: 295J mg/kg
Mercury: 1.30 mg/kg	Antimony: 30.0J mg/kg
- One discharging adit was observed at the site. The discharge eventually reached a tributary of the West Fork of Banner Creek downstream from the site. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded.
- A tributary to the West Fork of Banner Creek flows through the center of the site. An observed release to the tributary was documented for arsenic. No MCLs were exceeded in the tributary; however, the acute and chronic aquatic life criteria for zinc and the chronic aquatic life criteria for lead were exceeded both upstream and downstream from the site.
- Potential safety hazards observed at the site included unstable slopes near the collapsed adit, and a collapsing cabin.

Woodrow Wilson PA# 25-258  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/28/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-258-SE1	1.3 UJX	163 J	19.9	2.8	4.2	2.0 U	32.7	42500	0.20	70.2	4.2 U	34.7	15.1 UJ	33.4	NR
25-258-SE2	1.7 JX	67.4 J	18.7	1.0 U	3.9	1.7 U	18.0	20300	0.34	247	4.7	35.7	12.6 UJ	50.9	NR
25-258-SE3	7.1 JX	189 J	16.3	3.3 U	6.9 U	5.6 U	27.0	90000	0.58	34.8	11.8 U	49.8	42.1 UJ	20.1	NR
25-258-WR1	6.5 JX	295 J	28.3	0.7 U	1.5 U	1.2 U	12.0	10800	1.30	20.1	2.6 U	49.5	30.0 J	7.04	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
25-258-WR1	0.08	2.50	-0.33	-2.8	0.08	<0.01	<0.01	0.00	-0.33

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-258-AD1	0.12 U	5.0	5.8	4.0 UX	8.4 U	6.8 U	5.9 U	762	0.08 U	134	14.4 U	1.5	51.6 U	44.2 J	18.6
25-258-SW1	0.28	7.8	9.5	4.0 UX	8.4 U	6.8 U	5.9 U	1150	0.08 U	160	14.4 U	2.0	51.6 U	40.3 J	16.5
25-258-SW2	0.25	3.7	8.4	4.0 UX	8.4 U	6.8 U	5.9 U	347	0.08 U	118	14.4 U	1.4	51.6 U	38.6 J	14.4
25-258-SW3	0.12 U	2.4	9.7	4.0 UX	8.4 U	6.8 U	5.9 U	490	0.08 U	74.5	14.4 U	2.0	51.6 U	52.2 J	9.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-258-AD1	56	<5	24	0.06	NR
25-258-SW1	5.0	<5	20	0.06	NR
25-258-SW2	5.0	<5	18	0.06	NR
25-258-SW3	44	<5	14	0.06	NR

LEGEND

SE1 - Downstream of site and site discharge in West Fork of the West Fork of Banner Creek.  
SE2 - Downstream of part of dump and upstream of site discharge.  
SE3 - Upstream of mine in West Fork of the West Fork of Banner Creek.  
WR1 - Composite of the subsamples WR1A through 1C.  
BACKGROUND - From the Purchase Survey/Log Mine (25-258-881).

ADI - All discharge onto WR1.  
SW1 - Same as sample 25-258-SE1.  
SW2 - Same as sample 25-258-SE2.  
SW3 - Same as sample 25-258-SE3.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Peter</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>SW 1/4, SW 1/4, Section 20</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Silica</u>
Latitude: <u>N 46° 25' 27.2"</u>	Primary Drainage: <u>Banner Creek</u>
Longitude: <u>W 112° 15' 42.7"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>West Fork Banner Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 28, 1994</u>
Inspectors: <u>Tuesday, Clark, West</u>	P.A. # <u>25-259</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 730 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Arsenic: 142J mg/kg  
Mercury: 0.78 mg/kg
- One discharging adit was associated with the site. The flow from the adit eventually reached a tributary of the West Fork of Banner Creek. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron and lead were exceeded in the adit discharge.
- A tributary to the West Fork of Banner Creek flows adjacent to the site on the east side. No observed releases to the tributary were documented; however, the chronic aquatic life criteria for lead was exceeded both upstream and downstream from the site.
- Potential safety hazards observed at the site included an unstable slope on the waste rock dump due to the dump being undercut by the stream.

Peter PA# 25-259  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/28/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-259-SE1	0.9 UJX	93.7 J	20.5	1.5	27.4	1.4 U	20.5	14500	0.07	775	12.8	27.4	10.3 UJ	179	NR
25-259-SE2	1.4 UJX	117 J	46.4	1.3 U	17.2	4.4	43.7	32100	0.06	723	10.0	41.6	16.5 UJ	87.8	NR
25-259-WR1	2.0 JX	142 J	14.2	0.9	2.5	1.1 U	13.1	16500	0.78	225	3.8	22.7	8.5 UJ	23.6	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
25-259-WR1	0.28	8.75	1.32	-7.4	0.25	<0.01	0.03	0.00	1.32

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-259-AD1	0.12 U	10.2	11.0	5.5 JX	8.4 U	8.8 U	5.9 U	4870	0.08 U	329	14.4 U	1.6	51.6 U	95.7 J	28.0
25-259-SW1	0.12 U	2.9	5.5 U	4.0 UX	8.4 U	8.8 U	5.9 U	148	0.08 U	17.1	14.4 U	1.3	51.6 U	15.8 U	26.5
25-259-SW2	0.12 U	2.3	5.5 U	4.0 UX	8.4 U	8.8 U	5.9 U	102	0.08 U	9.3	14.4 U	1.6	51.6 U	15.8 U	25.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-259-AD1	9	<5	39	0.06	NR
25-259-SW1	59	<5	13	0.06	NR
25-259-SW2	60	<5	11	0.06	NR

LEGEND

SE1 - Downstream of mine in East Fork of West Fork of Barren Creek.  
SE2 - Upstream of mine in East Fork of West Fork of Barren Creek.  
WR1 - Composite of WR1A through 1C.  
BACKGROUND - From the Pioneer Energy Mine (25-004-SE1).  
AD1 - All discharge on WR1.  
SW1 - Same as sample 25-259-SE1.  
SW2 - Same as sample 25-259-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Queensbury</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>8N</u> R <u>5W</u>	Section(s): <u>SE 1/4, NW 1/4, Section 21</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 25' 57"</u>	Primary Drainage: <u>Banner Creek</u>
Longitude: <u>W 112° 14' 03"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Banner Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>July 26, 1994</u>
Inspectors: <u>Tuesday, Clark, West</u>	P.A. # <u>25-262</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 3,570 cubic yards of uncovered waste rock on-site. The following elements were elevated to at least three times the background concentrations:

Silver: 27.8 mg/kg	Arsenic: 63.6 mg/kg
Copper: 50.5 mg/kg	Mercury: 0.37JX to 0.41JX mg/kg
Lead: 727J mg/kg	
- One discharging adit was observed at the site which was routed through two settling ponds before discharging to Banner Creek. No MCLs were exceeded in the adit discharge; however, the acute and chronic aquatic life criteria for lead and zinc were exceeded.
- The adit discharge entered an intermittent drainage which was dry upstream from the site. Downstream from the site, the acute and chronic aquatic life criteria for cadmium and zinc and the chronic aquatic life criteria for lead were exceeded in this drainage.
- Potential safety hazards observed at the site included one collapsing cabin (low hazard potential).

Queensbury PA# 25-262  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/26/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
25-262-SE1	3.1	34.4	90.1	2.1	9.7	5.1	29.6	8710	0.07 JX	897	5.9	156 J	11.7 UJ	140	NR
25-262-SE2	2.3	8.2 U	41.3	1.0 U	2.6	5.2	6.3	3900	0.03 UJX	129	3.5 U	22.4 J	12.6 UJ	61.2	NR
25-262-SE3	1.7	7.7 U	50.2	2.5	4.6	3.7	10.7	4880	0.03 UJX	937	3.3 U	48.1 J	11.7 UJ	156	NR
25-262-SE4	1.0 U	7.8 U	35.0	1.1	3.6	2.0	25.8	3870	0.03 UJX	934	3.4 U	23.9 J	12.0 UJ	191	NR
25-262-WR1	1.5	63.6	104	0.8 U	1.6 U	1.8	4.7	2010	0.41 UJX	3.1	2.7 U	96.6 J	9.7 UJ	25.7	NR
25-262-WR2	27.8	31.7	85.9	0.9 U	1.9 U	2.5	50.5	8130	0.37 JX	56.0	3.2 U	727 J	11.5 UJ	86.3	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
25-262-WR1	0.02	0.62	0.03	0.03	-0.8	0.02	0.02	-0.01	0.00	0.03	<0.01	0.00	0.03	0.03	0.03	0.03	0.03	0.03
25-262-WR2	0.25	7.81	-1.69	-1.69	-9.50	0.14	0.06	0.06	1.87	-3.56	0.05	1.87	-3.56	0.05	1.87	-3.56	0.05	1.87

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-262-AD1	0.23	11.7	50.7	4.0 UX	8.4 U	7.1	5.9 U	824	0.08 U	170	14.4 U	21.8 J	51.6 U	106 J	19.9
25-262-SW2	0.16	4.9	31.7	4.0 UX	8.4 U	6.8 U	5.9 U	222	0.08 U	55.1	14.4 U	5.0 J	51.6 U	86.9 J	18.9
25-262-SW3	0.15	2.5	41.5	4.3 JX	8.4 U	6.8 U	5.9 U	528	0.08 U	644	14.4 U	3.3 J	51.6 U	98.4 J	22.4
25-262-SW4	0.13	3.2	25.9	4.0 UX	8.4 U	6.8 U	5.9 U	268	0.08 U	351	14.4 U	3.8 J	51.6 U	164 J	47.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-262-AD1	33	<5	11	0.06	NR
25-262-SW2	406	<5	13	0.06	NR
25-262-SW3	54	<5	11	0.06	NR
25-262-SW4	84	<5	31	0.06	NR

LEGEND

- SE1 - Upstream sediment in discharge.  
SE2 - Below upper mine at outfall.  
SE3 - Below lower dump.  
SE4 - Below Packer discharge.  
WR1 - Composite of subsamples WR2A, 2B, 3A, and 3B.  
WR2 - Composite of subsamples WR2A, 2B, 3A, and 3B.  
BACKGROUND - From the Packer Jam/King Mine (25-064-SE1).
- AD1 - Upper acid discharge (oxidized and gassy) with in Barren Creek.  
SW2 - Same as sample 25-262-SE2.  
SW3 - Same as sample 25-262-SE3.  
SW4 - Same as sample 25-262-SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Monte Cristo</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>NW 1/4, NW 1/4, NW 1/4, Section 17</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb</u>
Latitude: <u>N 46° 27' 4.7"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 15' 59.6"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Ruby Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 25, 1994</u>
Inspectors: <u>Tuesday, Clark, West</u>	P.A. # <u>25-275</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 5,935 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 23.6 mg/kg	Iron: 24,900 to 37,100 mg/kg
Arsenic: 243 to 540 mg/kg	Mercury: 0.11JX to 1.13JX mg/kg
Chromium: 6.7 mg/kg	Lead: 1,370J to 3,610J mg/kg
Copper: 61.9 to 121 mg/kg	Antimony: 42.1J to 184J mg/kg
- One discharging adit was observed at the site. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium, copper and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded in the adit discharge.
- The adit discharge flows over a waste rock dump and entered a swamp area. The acute and chronic aquatic life criteria for copper and the chronic aquatic life criteria for lead were exceeded in a surface water sample collected from the swamp. An intermittent drainage extended downstream from the swamp; however, the drainage was dry during the investigation.
- Potential safety hazards observed at the site included three open shafts and one open adit.

Monte Cristo PA# 25-275  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/25/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-275-WR1	1.9	243	79.4	1.9	4.4	6.7	61.9	24900	0.11 JX	441	6.0	1370 J	42.1 J	105	NR
25-275-WR2	23.6	540	129	4.2	2.8	3.3	121	37100	1.13 JX	511	2.6 U	3610 J	184 J	116	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE POTENT		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT		SULFUR ACID BASE POTENT	
	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000
25-275-WR1	0.02	0.62	3.87	3.25	<0.01	0.02	<0.01	0.02	0.02	0.02	<0.01	0.00	0.62	3.25	<0.01	0.00
25-275-WR2	0.06	1.87	-0.23	-2.1	0.06	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-275-AD1	0.51	23.1	21.3	6.4 JX	8.4 U	6.8 U	147	140	0.09	34.9	14.4 U	11.7 J	51.6 U	93.8 J	56.4
25-275-SW1	0.36	20.5	19.4	4.0 UX	8.4 U	6.8 U	54.9	110	0.08 U	25.6	14.4 U	3.4 J	51.6 U	35.8 J	53.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-275-AD1	95	<5	12	0.13	NR
25-275-SW1	94	<5	10	0.06	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.

WR2 - Grab sample of the WR2 subsample.

BACKGROUND - From the Pioneer Army/Naval Mine (25-46-581).

AD1 - All discharge onto WR1.

SW1 - Discharge after flowing through WR1 and into bog.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Upper Valley Forge</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 9N R 5W</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 33; NE 1/4,</u>
Mining District: <u>Rimini</u>	<u>SW 1/4, NE 1/4, Sec. 33</u>
Latitude: <u>N 46° 29' 30"</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Longitude: <u>W 112° 14' 28"</u>	Primary Drainage: <u>Tenmile Creek</u>
Land Status: <u>Private/Public</u>	USGS Code: <u>10030101</u>
Quad: <u>Chessman Reservoir</u>	Secondary Drainage: <u>Tenmile Creek</u>
Inspectors: <u>Bullock, Belanger/Pierson</u>	Date Investigated: <u>August 20, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>25-280 and 25-282</u>
<u>/Thomas, Dean &amp; Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 13,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 5380 to 121,000 mg/kg	Copper: 134 to 645 mg/kg
Iron: 108,000	Mercury: 0.477 to 0.691mg/kg
Lead: 7360 to 48,700 mg/kg	Antimony: 80.1 to 826 mg/kg
Zinc: 685J mg/kg	
- There was one adit in the upper workings that may discharge during a spring snow-melt period. Water accumulated near the adit had a pH of 5.7 and a specific conductance of 560 umhos/cm.
- A small seep emanated from the toe of WR-1 and then flowed into the unnamed tributary to Tenmile Creek. At the time of this investigation, the seep discharge was less than 1 gpm, with a pH of 2.66 and a specific conductance of 2720 umhos/cm. The discharge exceeded MCL/MCLGs for arsenic, cadmium, copper, nickel, and antimony. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc. The acute standard was also exceeded for iron.
- Observed releases were documented in the unnamed tributary for arsenic, cadmium, copper, iron, lead, and zinc. MCL/MCLGs were exceeded for arsenic and cadmium, both attributable to this site. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc; all directly attributable to this site except for the chronic lead exceedance. This unnamed tributary entered Tenmile Creek downstream from the City of Helena drinking water intake.

Upper Valley Forge PA# 25-280 and 25-282  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/20/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-280-SE-1	6340	38.3 J	29 J	17.9 J	6.32	414	28100	0.192	4040 J	3.95 U	2150	31.1	1610 J	NR
25-280-SE-2	92.6	37.7 J	2.7 J	3.37 J	7.25	14.3	9160	0.031 U	412 J	4.63	98.6	6.41 U	233 J	NR
25-280-WR-1	27200	8.13 J	5.7 J	2.2 J	2.48	134	30900	0.477	575 J	2.47 U	7360	88.2	685 J	NR
25-280-WR-2	5380	16.5 J	0.5 U	1.94 J	3.35	222	21200	0.386	28.7 J	2.38 U	8080	80.1	287 J	NR
25-280-WR-3	121000	1.82 J	1.7 J	3.81 J	1.33 U	645	108000	0.691	7.86 J	2.47 U	48700	826	171 J	NR
BACKGROUND	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
25-280-WR-1	1.82	56.9	4.25	-53	0.86	0.4	0.56	12.5	0.12 U	21700	-8.25	-8.25
25-280-WR-2	2.07	64.7	-3.7	-68	0.65	0.87	0.55	27.2	0.12 U	1560	-30.9	-30.9
25-280-WR-3	9.29	290	-4.7	295	<0.01	2.79	11.8	87.2	0.12 U	7.8	-91.8	-91.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-280-GW-1	23700 J	2.01 U	818	127	24.3 J	3710 J	184000 J	0.12 U	21700	112	2150	33.6	83300	381
25-280-SW-1	609 J	13.3	38.2	9.7 U	6.83 U	160 J	6820 J	0.12 U	1560	15.3	101	30.7 U	5320	116
25-280-SW-2	13.1 J	24.5	2.57 U	9.7 U	6.83 U	1.55 U	72.6 J	0.12 U	7.8	12.7 U	2.07	30.7 U	47.2	67.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested; ND - No Data

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-280-GW-1	2310	ND	1330	< 0.05	< 0.01
25-280-SW-1	235	< 5.0	134	< 0.05	< 0.01
25-280-SW-2	138	< 5.0	28	< 0.05	NR

LEGEND

- SE1 - Approx. 120' downgradient of waste rock dump 1.  
SW1 - Same as sample SE1.  
SE2 - Upgradient of site.  
SW2 - Same as sample SE2.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 3.  
WR2 - Composite of subsamples WR4 and 5.  
WR3 - Sample of the WR6 subsample.  
BACKGROUND - From the Red Water Mine (25-007-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>National Extension</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 5W</u>	Section(s): <u>SE 1/4, SE 1/4, SW 1/4, Section 10</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 27' 12"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 12' 34"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Beaver Creek</u>
Quad: <u>Chessman Reservoir</u>	Date Investigated: <u>August 10, 1994</u>
Inspectors: <u>Tuesday, Flammang, West</u>	P.A. # <u>25-287</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 7,530 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 31.1 to 58.5 mg/kg	Mercury: 3.07 to 10.7 mg/kg
Arsenic: 2,760 to 2,820 mg/kg	Lead: 5,790 to 12,900 mg/kg
Copper: 83.3 to 419 mg/kg	Antimony: 28.2J mg/kg
- One discharging adit was observed at the site. The discharge eventually merged with an unnamed tributary to Beaver Creek. The MCLs for arsenic and cadmium and the acute and chronic aquatic life criteria for arsenic, cadmium, copper, and zinc were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for iron and mercury were exceeded in the adit discharge.
- An unnamed tributary to Beaver Creek flows through the center of the site. Observed releases to the tributary (sediment) were documented for arsenic and lead. The MCL for cadmium was exceeded both upstream and downstream from the site; the MCL for arsenic was exceeded upstream from the site. The acute and chronic aquatic life criteria for cadmium, copper, and zinc and the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site. The acute aquatic life criteria for lead was exceeded downstream from the site; this exceedance was directly attributable to the site.
- Potential safety hazards observed at the site included an open pit and an unstable slope above a collapsed adit.

National Extension PA# 25-287  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/10/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-287-SE1	1.5	486	62.5	14.2	9.6	3.3	293	11900	0.13	3320	2.9 U	991	10.4 UJ	716	NR
25-287-SE2	7.2 U	56.1 U	70.2	6.7 U	14.0 U	11.9	104	3910	0.33	2390	24.1 U	120	86.2 UJ	454	NR
25-287-WR1	58.5	2760	40.7	1.6	1.7 U	2.8	419	22500	10.7	761	3.0 U	12900	28.2 J	380	NR
25-287-WR2	31.1	2820	30.3	0.6	1.2 U	1.0	83.3	13300	3.07	21.7	2.1 U	5790	17.3 J	116	NR
BACKGROUND	0.8 UJX	18.9 J	117	3.5	5.1	1.9	13.5	8300	0.03	1480	4.5	93.2	9.4 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		TOTAL ACID BASE		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
25-287-WR1	0.71	22.2	-0.55	-23	0.57	0.02	0.12	0.62	-1.17									
25-287-WR2	0.82	25.6	-3.20	-29	0.33	0.23	0.26	7.19	-10.4									

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
25-287-AD1	0.29	400	42.4	30.0	8.4 U	6.8 U	173	8300	0.17	2000	14.4 U	395	51.6 U	4490	54.8
25-287-SW1	0.16	45.3	27.2	20.3	8.4 U	6.8 U	76.7	951	0.16	780	14.4 U	91.0	51.6 U	2490	39.9
25-287-SW2	0.12 U	78.8	113	14.6	8.4 U	6.8 U	115	1230	0.29	5840	15.8	80.0	51.6 U	798	109

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
25-287-AD1	43	<5	44	<0.05	NR
25-287-SW1	68	<5	36	<0.05	NR
25-287-SW2	<4.0	<5	6.0	<0.05	NR

LEGEND

- SE1 - 15' downgradient of WR2.  
SE2 - 25' above pond about 4' below spring which begins creek.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Composite of subsamples WR2A, 2B, and 2C.  
BACKGROUND - From the Pioneer Landfill Mine (25-496-381).
- AD1 - Discharge from adit associated with WR2, approx. 6' after emerging from ground.  
SW1 - Same as sample 25-287-SE1.  
SW2 - Same as sample 25-287-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Monitor Creek Tailings</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 8N R 6W</u>	Section(s): <u>NW 1/4, SE 1/4, NW 1/4, Section 24</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 25' 46"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 17' 56"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Monitor Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>August 3, 1994</u>
Inspectors: <u>Tuesday, Bisch, Flammang, West</u>	P.A. # <u>25-503</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 19,650 cubic yards. The tailings are located in two separate areas with approximately 6,740 cubic yards located directly in or very near the Monitor Creek drainage. The following elements were elevated to at least three times the background concentrations:  
Silver: 4.8J to 4.9J mg/kg  
Mercury: 1.79 mg/kg
- No waste rock dumps were observed at the site during the investigation; however, there was evidence of extensive placer workings in Monitor Creek both upstream and downstream from the site.
- An observed release to Monitor Creek (sediment) was documented for silver. No MCLs were exceeded in Monitor Creek; however, the acute and chronic aquatic life criteria for copper and zinc were exceeded both upstream and downstream from the site. Additionally, the chronic aquatic life criteria for mercury and lead were exceeded both upstream and downstream from the site.
- No hazardous openings or structures were observed at the site during the investigation; however, one tailings pile was being undercut by the stream, thus, creating an unstable bank.

Monitor Creek Tailings PA# 25-503  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/03/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-503-SE1	3.4 J	30.2	12.3	0.9 U	2.4 J	1.5 U	11.8	10100	1.00	238 JX	3.4	63.2	11.5 UJ	28.2	NR
25-503-SE3	4.2 J	9.6	2.6	0.9 U	1.8 UJ	1.5 U	3.1	3810	0.23	5.6 JX	3.2 U	28.9	11.3 UJ	7.6	NR
25-503-SE4	1.4 J	9.0 U	10.1	1.3	2.2 UJ	1.8 U	6.7	7090	0.08	9.4 JX	3.9 U	50.9	13.8 UJ	12.7	NR
25-503-TP1	4.8 J	15.2	11.4	0.8 U	1.8 UJ	1.4 U	6.2	9250	1.79	18.0 JX	3.0 U	51.9	10.8 UJ	17.9	<0.275
25-503-TP2	4.9 J	7.4 U	4.9	0.9 U	1.8 UJ	1.5 U	4.1	4750	0.38	3.3 JX	3.2 U	35.9	11.3 UJ	7.4	<0.275
BACKGROUND	1.0 U	84.1 J	67.8 J	1.0 UJ	2.5	2.5 J	55.9	7500 JX	0.24 JX	442 J	3.5 U	53.3	12.5 UJ	57.6	

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		ACID BASE	
	%	1/1000	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT.	1/1000	
25-503-TP1	0.02	0.62	1.22	0.59	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	1.22	0.03	0.03	
25-503-TP2	0.01	0.31	0.03	-0.3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.03	0.03	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
25-503-SW3	0.12 U	1.1 U	29.5	4.0 U	8.4 U	6.8 U	7.4	857	0.17 JX	183	14.4 U	12.2	51.6 U	204	28.5
25-503-SW4	0.12 U	1.1 U	28.2	4.9	8.4 U	6.8 U	9.6	687	0.08 JX	136	14.4 U	10.5	51.6 U	209	17.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
25-503-SW3	67	<5.0	35	0.05	NR
25-503-SW4	58	<5.0	33	0.09	NR

LEGEND

- SE1 - Downstream sed. in Tertiary Old est. west of TP1 where beach debris in Tertiary Old.  
SE3 - Downstream of TP2 in Monitor Creek.  
SE4 - Upstream of TP2 in Monitor Creek, downstream of waste rock workings.  
TP1 - Composite of TP1A-1, 1A-2, 1B-1, 1B-2, 1C-1, and 1C-2.  
TP2 - Composite of TP2A-1 through 2A-4, 2B-1 through 2B-3, and 2C-1 through 2C-4.  
BACKGROUND - From the Amphibole Mine (22-431-SE1).
- SW3 - Same as sample 25-503-SE3.  
SW4 - Same as sample 25-503-SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bear Gulch</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>9N</u> R <u>5W</u>	Section(s): <u>NW 1/4, NE 1/4, NW 1/4, Section 17</u>
Mining District: <u>Rimini</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 32' 32"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 15' 43"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Bear Gulch</u>
Quad: <u>MacDonald Pass</u>	Date Investigated: <u>August 16, 1994</u>
Inspectors: <u>Tuesday, Bisch, West</u>	P.A. # <u>25-504</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 4,720 cubic yards. The following element was elevated to at least three times the background concentrations:  
Copper: 129 mg/kg
- One discharging adit was observed at the site. The discharge was contained in a small lined pond after flowing a short distance. The MCL for cadmium and the acute and chronic aquatic life criteria for cadmium and copper were exceeded in the adit discharge. Additionally, the chronic aquatic life criteria for mercury was exceeded in the adit discharge.
- Bear Gulch flows adjacent to the site on the south side. The MCL for cadmium, as well as the acute and chronic aquatic life criteria for cadmium, were exceeded in the downstream sample. The chronic aquatic life criteria for mercury was exceeded both upstream and downstream from the site. None of these exceedances were attributable to the site.
- No hazardous openings or structures were located at the site.

**Bear Gulch Mine PA# 25-504**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 08/16/94**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-504-SE1	1.4 U	10.7 U	297	1.4	3.2	12.7	54.2	25000	0.13	508 J	13.9	14.1 U	16.5 U	47.9	NR
25-504-SE2	1.8 U	14.1 U	195	1.8	4.9	5.4	29.3	10200	0.16	366 J	7.8	34.6	21.6 U	53.8	NR
25-504-WR1	12.0	81.6	82.4	0.9	2.0	6.4	129	36100	0.11	268 J	3.1	229	7.4 U	44.0	NR
BACKGROUND	NR	87 J	84.6	2.5	11.9	7.4 J	21 J	16200	0.053	1130	8 J	144 J	6 UJ	167	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000
25-504-WR1	0.45	14.1	10.1	-4	0.43	<0.01	0.02	0.00	10.1							

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-504-AD1	0.12 U	1.1	5.5 U	8.1 JX	11.3	6.8 U	27.3	151	0.21	48.0	14.4 U	0.6	51.6 U	15.8 U	155
25-504-SW1	0.12 U	1.4	28.7	10.6 JX	12.3	6.8 U	5.9 U	149	0.21	4.0	14.4 U	0.8	51.6 U	15.8 U	43.1
25-504-SW2	0.12 U	1.2	30.3	4.0 UX	8.4 U	6.8 U	5.9 U	189	0.22	13.3	14.4 U	0.7	51.6 U	15.8 U	43.0

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-504-AD1	144	<5	78	<0.05	NR
25-504-SW1	35	<5	11	<0.05	NR
25-504-SW2	36	<5	12	<0.05	NR

**LEGEND**

SE1 - Downstream from dump in Bear Gulch.  
 SE2 - Upstream from mine in Bear Gulch.  
 WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 BACKGROUND - From the Red Water Mine (25-407-SE1) (1993 Data).  
 AD1 - All discharge above waste rock dump 1, north of road and Bear Gulch.  
 SW1 - Same as sample 25-504-SE1.  
 SW2 - Same as sample 25-504-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Franklin</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>10N</u> R <u>4W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 11</u>
Mining District: <u>Scratch Gravel</u>	Mine Type: <u>Hardrock/Ag. Cu. Au. Pb</u>
Latitude: <u>N 46° 38' 22"</u>	Primary Drainage: <u>Tenmile Creek</u>
Longitude: <u>W 112° 04' 25"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Tenmile Creek</u>
Quad: <u>Scratchgravel Hills</u>	Date Investigated: <u>August 31, 1993</u>
Inspectors: <u>Tuesday, Flammang/Pierson</u>	P.A. # <u>25-339</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be 1,100 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 5.22 mg/kg                      Lead: 1,250 mg/kg  
Copper: 199 mg/kg                        Zinc: 832 mg/kg
- The volume of waste rock associated with this site was estimated to be 12,035 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 223 mg/kg                      Lead: 358 to 6,170 mg/kg  
Cadmium: 4.10 mg/kg                    Zinc: 314 mg/kg  
Copper: 128 to 1,190 mg/kg            Mercury: 0.257 to 0.612 mg/kg  
Antimony: 22.6 mg/kg
- The volume of CN heap leach material associated with this site was estimated to be 10,000 cubic yards. The concentration of cyanide in the material was measured at 0.366 mg/kg; additionally, the following elements were elevated at least three times background:  
Cadmium: 3.00 mg/kg                    Zinc: 372 mg/kg  
Copper: 142 mg/kg                        Lead: 502 mg/kg
- There were no adit discharges, seeps, springs, or streams associated with this site. A grate placed over the shaft disallowed sampling of groundwater.
- Five potentially hazardous structures and one caving shaft were located on site. The majority of site was enclosed by barbed wire fences and locked gates.

Franklin Mine PA# 25-339  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-TUESDAY  
INVESTIGATION DATE: 8/31/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-339-LP-1	12.2	75.6	3.00	8.5	3.39	142	25800	0.164	1360	7.8	502	< 6.15	372	0.366
25-339-LP-3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.688
25-339-TP-1	71.7	33	5.22	5.86	7.11	199	17500	0.079	617	5.35	1250	< 6.19	832	NR
25-339-WR-1	223	29.6	4.10	4.79	2.91	1190	37200	0.612	889	5.81	6170	22.6	314	NR
25-339-WR-2	13.8	78.4	0.74	6.35	2.64	128	22500	0.257	988	3.31	358	< 5.11	117	NR
BACKGROUND	27.1	165	1.32	13.6	17.9	29.7	23300	0.071	872	17.9	36.3	< 6.98	76.4	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR /1000x	ACID BASE POTENT. /1000x	NEUTRAL POTENT. /1000x	TOTAL SULFUR POTENT. /1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR /1000x	ACID BASE POTENT. /1000x	PYRITIC SULFUR /1000x	ACID BASE POTENT. /1000x
25-339-LP-1	0.45	14.1	22	119	7.92	0.04	0.05	0.36	1.58	20.4		
25-339-LP-3	0.2	6.25	119	112	112	0.08	0.04	0.08	1.25	117		
25-339-TP-1	0.29	9.06	7.03	-2	-2	0.15	0.03	0.11	0.94	6.09		
25-339-WR-1	4.6	144	-5.5	-149	-149	2.23	1.4	0.97	43.7	-49.2		
25-339-WR-2	1.18	36.9	2.95	-34	-34	0.64	<0.01	0.56	0	2.95		

LEGEND

LP1 - Composite of subsamples LP1A, 1B, and 2.  
LP3 - Sample of LP3.  
WR1 - Composite of the subsamples WR1 and 3A through 3D.  
WR2 - Composite of subsamples 2A through 2C and 5.  
BACKGROUND - On ridge SE of waste rock dump 1 and SW of WR2C.  
TP1 - Composite of subsamples TP1A and 1B.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>NE NW S13</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>13N</u> R <u>7W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 13</u>
Mining District: <u>Stemple</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 53' 33"</u>	Primary Drainage: <u>Virginia Creek</u>
Longitude: <u>W 112° 26' 08"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Fool Hen Creek</u>
Quad: <u>Stemple Pass</u>	Date Investigated: <u>August 30, 1993</u>
Inspectors: <u>M. Babits, S. Babits</u>	P.A. # <u>25-197</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 175,000 cubic yards. The following elements were elevated at least three times background:  
Lead: 256J mg/kg
- No waste rock was observed at this site during the investigation.
- One discharging adit was identified at the site. At the time of the site visit, this flowing adit made up the entire flow in Fool Hen Creek. Surface water and sediment samples were collected upstream and downstream from the site in Fool Hen Creek. The MCL for arsenic was exceeded in the downstream sample; however, this exceedance was not attributable to the site. An observed release to Fool Hen Creek was documented for lead. Acute and chronic aquatic life criteria were exceeded for copper in the upstream sample. The chronic aquatic life criteria for lead was exceeded in the downstream sample, which was directly attributable to the site.
- Potential safety hazards identified at the site included an open adit and five collapsing cabins.

NE NW Section 13 PA# 25-197  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/30/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-197-SE-2	4.97 U	42.2 JX	1.1 J	1.04 U	6.89	18.9	2680	5.66 JX	239	2.26 U	59.9 J	6.57 UJ	72.3	2.61
25-197-TP-1	10.5	124 JX	1.8 J	2.48	17.5	33.3	6140	1.55 JX	599	7.43 J	87.1 J	5.65 UJ	195	NR
25-197-TP-2	13.7	134 JX	3.5 J	1.55	17.9	78	7250	0.313 JX	1260	6.55 J	256 J	7.12 UJ	317	2.2
BACKGROUND	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	899	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT.	1/1000
25-197-TP-1	<0.01	0	0	139	139	<0.01	<0.01	<0.01	<0.01	<0.01	0	0	0.01	0.01	0	0	139	139
25-197-TP-1DUP	<0.01	0	0	138	138	<0.01	<0.01	<0.01	<0.01	<0.01	0	0	0.01	0.01	0	0	138	138
25-197-TP-2	0.47	14.7	14.7	2.58	2.58	0.3	0.3	0.14	0.14	0.03	4.37	4.37	0.03	0.03	4.37	4.37	-1.8	-1.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-197-SW-1	5.83 J	416	2.57 U	9.7 U	13.3 J	31.3 J	11.8 UX	0.12 U	4.08 U	12.7 U	2.55 J	30.7 U	7.57 U	116
25-197-SW-2	90.8 J	396	2.57 U	9.7 U	6.83 U	4.9 J	73.2 JX	0.12 U	26.8	12.7 U	24.5 J	30.7 U	7.57 U	116

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-197-SW-1	119 <	5	5	0.13 <	0.005
25-197-SW-2	127 <	5	6	0.08 <	0.005

LEGEND

SE2 - Downgradient (75') from tailings pond 1 in Fool Hen Creek  
TP1 - Composite of subsamples TP1A-A, 1A-B, and 1B-A  
TP2 - Composite of subsamples TP1A-C, 1B-B, and 1B-C  
BACKGROUND - From SE SW Sec. 10 (25-212-S9-1)  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

<b>Mine/Site Name:</b> <u>Swansea Tailings/Mine</u>	<b>County:</b> <u>Lewis and Clark</u>
<b>Legal Description:</b> <u>T 13N R 7W</u>	<b>Section(s):</b> <u>NW 1/4, NE 1/4, Sec. 18</u>
<b>Mining District:</b> <u>Stemple</u>	<b>Mine Type:</b> <u>Hardrock/Au, Ag, Pb, Cu</u>
<b>Latitude:</b> <u>N 46° 53' 27"</u>	<b>Primary Drainage:</b> <u>Poorman Creek</u>
<b>Longitude:</b> <u>W 112° 32' 17"</u>	<b>USGS Code:</b> <u>17010201</u>
<b>Land Status:</b> <u>Private</u>	<b>Secondary Drainage:</b> <u>Swansea Gulch</u>
<b>Quad:</b> <u>Swede Gulch</u>	<b>Date Investigated:</b> <u>September 1, 1993</u>
<b>Inspectors:</b> <u>Bullock, M. Babits, S. Babits,</u>	<b>P.A. #</b> <u>25-208</u>
<u>Flammang, Pierson</u>	
<b>Organization:</b> <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 3700 cubic yards. The following elements were elevated at least three times background:

Cadmium: 25 mg/kg	Copper: 2010JX mg/kg
Lead: 2510 mg/kg	Antimony: 39.1J mg/kg
Zinc: 503J mg/kg	
  
- The volume of waste rock associated with this site was estimated to be approximately 15,000 cubic yards. The following elements were elevated at least three times background:

Cadmium: 6 to 14 mg/kg	Copper: 1050JX to 1910JX mg/kg
Mercury: 0.179JX to 0.736JX mg/kg	Manganese: 1130 mg/kg
Lead: 361 to 1610 mg/kg	Antimony: 22.5J mg/kg
Zinc: 239J to 629J mg/kg	
  
- There was one discharging adit associated with this site. The water discharging from the adit had a neutral pH (7.29) and did not exceed and MCL/MCLGs or aquatic life criteria.
  
- There were no observed releases to Swansea Gulch based on the surface water samples collected during this investigation. No exceedances of MCL/MCLGs or aquatic life criteria attributable to this site were documented. The surface water and sediment data collected did indicate a possible upstream source of contaminants that was not identified during this investigation. Spring runoff or storm event sampling would probably document releases from this site due to uncontained contaminant sources in the drainage.

Swansea Tailings PA# 25-208  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/01/93

SOLID MATRIX ANALYSES

Metals in soils														
Results per dry weight basis														
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-208-SE-1	19.1 J	61 J	6.3	3.15 J	13.2 J	1160 JX	5730	0.047 UX	146	7.92 J	863	11.8 J	275 J	NR
25-208-SE-2	4.24 U	67.6 J	0.8 U	4.22 J	16.7 J	15.2 JX	8190	0.031 UX	291	11.6 J	24.2	5.6 UJ	49.3 J	NR
25-208-TP-1	49.5 J	29.5 J	25.0	1.59 J	6.44 J	2010 JX	5230	0.033 UX	183	3.46 J	2510	39.1 J	503 J	4.14
25-208-WR-1	32.8 J	67.9 J	6.4	4.77 J	16.5 J	1050 JX	7760	0.179 JX	285	12.1 J	815	22.5 J	217 J	NR
25-208-WR-2	22.5 J	173 J	13.4	8.38 J	19.4 J	1910 JX	13900	0.318 JX	1130	22.4 J	1610	5.97 UJ	629 J	NR
25-208-WR-3	8.2 J	80.6 J	13.5	4.34 J	14.8 J	361 JX	7230	0.736 JX	425	14.2 J	361	5.66 UJ	239 J	NR
BACKGROUND	19.5 J	168 J	1 U	9.67 J	36.5 J	228 JX	12800	0.033 UX	468	30.4 J	34.4	6.95 UJ	66.9 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			ORGANIC			PYRITIC			SULFUR		
	SULFUR %	ACID BASE v/1000x	POTENT. v/1000x	NEUTRAL. POTENT. v/1000x	ACID BASE POTENT. v/1000x	SULFATE %	SULFUR %	PYRITIC %	ORGANIC %	SULFUR v/1000x	ACID BASE v/1000x	POTENT. v/1000x	SULFUR v/1000x	ACID BASE POTENT. v/1000x	SULFATE %
25-208-TP-1	<0.01	0	3.23	3.23	3.23	<0.01	<0.01	<0.01	<0.01	0	0.31	9.33	3.23	9.33	3.23
25-208-WR-1	<0.01	0	9.64	9.64	9.64	<0.01	<0.01	<0.01	<0.01	0	0	8.18	9.33	8.18	9.33
25-208-WR-2DUP	<0.01	0	8.18	8.18	8.18	<0.01	<0.01	<0.01	<0.01	0	0	8.42	8.18	8.42	8.18
25-208-WR-2	<0.01	0	8.42	8.42	8.42	<0.01	<0.01	<0.01	<0.01	0	0.31	8.42	8.42	8.42	8.42
25-208-WR-3	<0.01	0	37.3	37.3	37.3	<0.01	<0.01	<0.01	<0.01	0.01	0.31	37	37	37	37

WATER MATRIX ANALYSES

Metals in Water Results in ug/L													
FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn
25-208-SW-1	7.15 J	62.9	2.57 U	9.7 U	11.9 J	21.3 J	265 JX	0.12 U	17.5	12.7 U	4.32 J	30.7 U	9.5
25-208-SW-2	3.92 J	88.8	2.57 U	9.7 U	12.6 J	15.2 J	19.4 JX	0.12 U	4.13	12.7 U	2.53 J	30.7 U	7.6
25-208-SW-3	1.18 U	91.4	4.59 U	5 U	6.24 U	2.33 U	14.7	0.12 U	3.76 U	10.9 U	0.82	31.7 U	11.5

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL				CYANIDE			
	DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	SULFATE	NO3/NO2-N	CHLORIDE	CYANIDE
25-208-SW-1	117	< 5	10	0.11	10	0.11	5	NR
25-208-SW-2	106	< 5	9	0.07	9	0.07	5	NR
25-208-SW-3	77	< 5	5	0.15	5	0.15	5	NR

LEGEND

- SE1 - Upgradient of mine and confluence, 40' up from road crossing  
SE2 - Swansea Gulch, downgradient of waste rock dump 5.  
TP1 - Composite of subsamples TP1A-A through 1A-C.  
WR1 - Composite of subsamples WR1, 2A, 2B, 3A, and 3B.  
WR2 - Composite of subsamples WR4A through 4D.  
WR3 - Composite of subsamples WR5A and 5B.  
BACKGROUN - From the Swansea Tailings (25-208-SW-1).  
WR2DUP - Duplicate of the 25-208-WR-2 sample.
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Add discharge at waste rock dump 5.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>SE SW S10</u>	County: <u>Lewis and Clark</u>
Legal Description: T <u>13N</u> R <u>7W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 10</u>
Mining District: <u>Stemple</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 46° 53' 38"</u>	Primary Drainage: <u>Canyon Creek</u>
Longitude: <u>W 112° 28' 45"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Virginia Creek</u>
Quad: <u>Stemple Pass</u>	Date Investigated: <u>August 30, 1993</u>
Inspectors: <u>M. Babits, S. Babits</u>	P.A. # <u>25-212</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 2,750 cubic yards. The following elements were elevated at least three times background:  
Copper: 92.8 mg/kg      Mercury: 8.15JX mg/kg  
Lead: 215J mg/kg
- No waste rock was observed at the site during the investigation.
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- No surface water or sediment samples were collected during the investigation, due to the lack of direct runoff routes to surface water located nearest to the site.
- No hazardous mine openings were identified at the site; however, the mill building was collapsing and potentially hazardous.

SE SW Section 10 PA# 25-212  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/30/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-212-TP-1	47.6	278 JX	2.9 J	5.86	4.24	92.8	14300	8.15 JX	803	11.7 J	215 J	6.28 UJ	190	0.305 U
BACKGROUND	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	889	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	NEUTRAL	POTENT.	SULFUR	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.
25-212-TP-1	<0.01	0	170	170	<0.01	<0.01	<0.01	0	<0.01	<0.01	0	0	170	170

LEGEND

TP1 - Composite of subsamples TP1A-A, 1B-A, and 1B-B.  
BACKGROUND - On East side of Virginia Creek.  
From SE SW Sec. 10 (25-212-S8-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Astor  
Legal Description: T 13N R 7W  
Mining District: Stemple  
Latitude: N 46° 52' 34"  
Longitude: W 112° 26' 54"  
Land Status: Private/Public  
Quad: Stemple Pass  
Inspectors: M. Babits, S. Babits  
Organization: Pioneer Technical Services, Inc.

County: Lewis and Clark  
Section(s): NE 1/4, NE 1/4, Sec. 23  
Mine Type: Hardrock/Unknown  
Primary Drainage: Virginia Creek  
USGS Code: 10030101  
Secondary Drainage: Gould Creek  
Date Investigated: August 31, 1993  
P.A. # 25-227

- The volume of tailings associated with this site was estimated to be approximately 2 cubic yards. Due to the extremely small volume, no samples were collected for laboratory analysis.
- The volume of waste rock associated with this site was estimated to be approximately 25,000 cubic yards; however, no metals concentrations were elevated significantly above background.
- One discharging adit was identified at the site; the adit discharge entered Gould Creek after flowing through the waste rock pile located on site. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for lead. The adit discharge pH measurement was 7.65.
- Surface water and sediment samples were collected upstream and downstream from the site in Gould Creek. No MCLs were exceeded; however, the chronic aquatic life criteria for mercury was exceeded in both upstream and downstream samples. The chronic aquatic life criteria for lead was exceeded in the downstream sample. Concentrations of barium, cobalt, copper, iron, nickel, and lead were elevated (>3X) in the downstream sediment sample, compared to the upstream sediment sample.
- No hazardous mine openings were identified at the site.

**Astor PA# 25-227**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/31/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-227-SE-1	7.15	51.8 JX	1.7 J	2.47	5.41	23	6980	15.1 JX	200	3.06 J	65.7 J	6.26 UJ	103	0.314 U
25-227-SE-2	19	187 JX	3.7 J	9.12	11.4	104	21700	17.7 JX	552	13.2 J	231 J	12.5 UJ	221	0.672 U
25-227-WR-1	48.7	84.1 JX	2.0 J	8.62	3.14	80.5	28500	0.203 JX	946	3.71 J	149 J	4.88 UJ	155	NR
BACKGROUND	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	889	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL			SULFUR			PYRITIC			ORGANIC			SULFUR		
	SULFUR	ACID BASE	%	NEUTRAL	POTENT.	%	SULFUR	ACID BASE	POTENT.	SULFUR	ACID BASE	POTENT.	SULFUR	ACID BASE	POTENT.
25-227-WR-1	<0.01	0	<0.01	40.2	40.2	<0.01	<0.01	<0.01	0	<0.01	<0.01	0	40.2	40.2	

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-227-SW-1	7.24 J	76.3	2.57 U	9.7 U	6.83 U	9.3 J	51.7 JX	0.14	11.7	12.7 U	3.01 J	30.7 U	7.57 U	115
25-227-SW-2	13.4 J	61.9	2.57 U	9.7 U	6.83 U	11.7 J	121 JX	0.78	12.6	12.7 U	5.9 J	30.7 U	13.5	115
25-227-SW-3	16.8 J	9.8	2.57 U	9.7 U	6.83 U	1.55 U	101 JX	0.12 U	4.08 U	12.7 U	5.08 J	30.7 U	7.57 U	90.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-227-SW-1	139	< 5	5	< 0.05	< 0.005
25-227-SW-2	128	< 5	7	< 0.05	< 0.005
25-227-SW-3	120	< 5	6	0.09	NR

**LEGEND**

SE1 - Upgradient (175') in Gould Creek (mill building).

SE2 - Downgradient (270') in Gould Creek (cabin).

WR1 - Composite of subsamples WR1A, 1B, and 1C.

BACKGROUND - From SE SW Sec.10 (25-212-SS-1).

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW3 - Adit discharge at waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Jay Gould Mine and Millsite</u>	County: <u>Lewis and Clark</u>
Legal Description: <u>T 13N R 7W</u>	Section(s): <u>S 1/2, Section 14</u>
Mining District: <u>Stemple</u>	Mine Type: <u>Hardrock/Au. Ag</u>
Latitude: <u>N 46° 52' 44"</u>	Primary Drainage: <u>Virginia Creek</u>
Longitude: <u>W 112° 27' 19"</u>	USGS Code: <u>10030101</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Gould Creek</u>
Quad: <u>Stemple Pass</u>	Date Investigated: <u>June 21, 1994</u>
Inspectors: <u>Tuesday, Belanger, Clark, West</u>	P.A. # <u>25-500</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 1,820 cubic yards. The following elements were elevated to at least three times the background concentrations:  
Cadmium: 9.5J mg/kg                      Zinc: 562J mg/kg  
Copper: 149 mg/kg                      Mercury: 115JX mg/kg  
Lead: 678 mg/kg
- The volume of waste rock observed at the site was estimated to be 7,730 cubic yards; however, no elements were significantly elevated (>3X) above background concentrations.
- One discharging adit was observed at the site. No MCLs or aquatic life criteria were exceeded in the adit discharge.
- Gould Creek flows through the center of the site. Observed releases to Gould Creek (sediment) were documented for mercury and lead. No MCLs or aquatic life criteria were exceeded in Gould Creek.
- Potential safety hazards observed at the site included the collapsed mill building, several collapsed cabins, and a steep highwall located above the adit.

Jay Gould Mine/Mill PA# 25-500  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/21/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
25-500-SE1	18	10.0	29.3 J	0.8 U	2.1 U	2.5 J	19.1	5680	1.13	218 J	2.0 U	48.8	7.2 U	79.8	NR
25-500-SE2	42.7	16.8	41.8 J	0.6 U	2.1 U	5.4 J	26.5	9280	34.8	162 J	4.6	100	7.2 U	80.4	NR
25-500-SE3	1.2 U	11.8 U	93.9 J	1.1 U	3.8 U	7.2 J	11.5	7380	0.21	235 J	5.8	16.1 U	12.9 U	44.3	NR
25-500-TP1	20.9	23.3	92.7	9.5 J	1.6 U	5.6	149	10200	115 JX	941	1.5 U	678	21.2 J	582 J	21.8
25-500-WR1	3	18.6	132	0.6	3.7	5.9	44.3	8480	0.66 JX	547	7.6	47.2	4.6 UJ	53.6 J	NR
BACKGROUND	NR	21.3	145 JX	1.4 J	5.28	8.61	29.6	11900	0.758 JX	889	12.3 J	60.3 J	8.01 UJ	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR %		PYRITIC SULFUR %		ORGANIC SULFUR %		PYRITIC SULFUR ACID BASE POTENT.	
		1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%
25-500-TP1	<0.01	0.00	169	169	<0.01	0.00	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	169
25-500-WR1	0.01	0.31	75.8	75.5	<0.01	0.01	0.31	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.31	75.5

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
25-500-AD1	0.12 U	1.1 U	118	2.6 U	8.7 U	4.7 UX	4.6 U	9.4 U	0.11 U	4.4 U	8.0 U	1.6	29.4 U	13.2	114
25-500-SW1	0.12 U	1.5	78.1	2.6 U	8.7 U	5.7 JX	4.6 U	36.3	0.11 U	7.13	8.0 U	1.8	29.4 U	9.4	119
25-500-SW2	0.12 U	1.3	49.7	2.6 U	8.7 U	4.7 JX	4.6 U	20.5	0.11 U	7.1	8.0 U	1.5	29.4 U	4.67	109
25-500-SW3	0.12 U	1.3	38.4	2.6 U	8.7 U	4.7 UX	4.6 U	64.7	0.11 U	5.2	8.0 U	1.6	29.4 U	4.67	106

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
25-500-AD1	140	<5	5.0	0.13	NR
25-500-SW1	178	<5.0	<5.0	<0.05	NR
25-500-SW2	128	<5	<5	<0.05	NR
25-500-SW3	110	<5	<5	<0.05	NR

LEGEND

- SE1 - Determination of tailings in Gould Creek.
- SE2 - Determination of mine and upstream of mill and tailings in Gould Creek.
- SE3 - Upstream of mine in Gould Creek.
- TP1 - Composite of subsamples TP2A and TP2A-1 through 1A-3.
- WR1 - Composite of subsamples WR1A and 1B.
- BACKGROUND - From the SE SW Sec. 10 Mine (25-212-SE1) (1993 Data).
- AD1 - A-2 discharge on WR1.
- SW1 - Same as sample 25-500-SE1.
- SW2 - Same as sample 25-500-SE2.
- SW3 - Same as sample 25-500-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Snowshoe  
Legal Description: T 28N R 31W  
Mining District: Libby  
Latitude: N 48° 12' 17"  
Longitude: W 115° 38' 42"  
Land Status: Private  
Quad: Showshoe Peak  
Inspectors: Tuesday, Belanger, Lasher  
Organization: Pioneer Technical Services, Inc.

County: Lincoln  
Section(s): NE 1/4, NW 1/4, Sec. 7  
Mine Type: Hardrock/Pb, Zn, Ag  
Primary Drainage: Snowshoe Creek  
USGS Code: 17010101  
Secondary Drainage: Snowshoe Creek  
Date Investigated: August 4, 1993  
P.A. # 27-005

- The volume of tailings associated with this site was estimated to be approximately 5,000 cubic yards. The tailings were located within the floodplain of Snowshoe Creek. The following elements were elevated at least three times background:

Arsenic: 3,840J mg/kg	Mercury: 0.4 mg/kg
Cadmium: 142 mg/kg	Lead: 44,300 mg/kg
Copper: 664 mg/kg	Antimony: 109 mg/kg
Iron: 98,200 mg/kg	Zinc: 11,700 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 3,990 cubic yards. Some reclamation had been done on the lower dump (WR4). The following elements were elevated at least three times background:

Arsenic: 3,230 mg/kg	Mercury: 1.11 mg/kg
Cadmium: 81.8 mg/kg	Lead: 59,300 mg/kg
Copper: 545 mg/kg	Antimony: 120 mg/kg
Iron: 64,400 mg/kg	Zinc: 6,530 mg/kg
- There were no adit discharges associated with the site; however, an intermittent tributary to perennial Snowshoe Creek ran through the site. The tributary had a trickle of flow during the investigation which exceeded the MCL for cadmium. The downstream sample in Snowshoe creek also exceeded the MCL for cadmium. Acute aquatic life criteria were exceeded for cadmium, lead, and zinc in the tributary and Snowshoe Creek. Chronic aquatic life criteria were exceeded for cadmium, mercury, lead, and zinc in the tributary and Snowshoe Creek.
- Observed releases to Snowshoe Creek were documented for arsenic, cadmium, iron, lead, and zinc. The aquatic life criteria exceedances and the MCL exceedances for cadmium can be directly attributed to the site.
- The three open adits and several steep, unstable waste piles were accessible and potentially hazardous.

**Snowshoe PA# 27-005**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 08/04/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
27-005-SE-1	17.2 J	12.5	1.09	5.63	1.46	10.1	15700	0.04	308	5.2	21.4	6.29 U	45.5	NR
27-005-SE-2	1350 J	6.45	115	7.82	1.78	226	78700	0.037	4580	5.4	8320	32.2	9270	NR
27-005-TP-1	3840 J	4.91	142	5.52	1.58 U	664	98200	0.4	1150	2.93 U	44300	109	11700	NR
27-005-WR-1	3230 J	7.58	81.8	8.44	1.73	545	64400	1.11	1120	6.16	59300	120	6530	NR
BACKGROUND	54.2 J	18.5	1.23	9.23	1.59 U	29.4	21400	0.061	475	11.8	198	7.15 U	213	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	%	%	%	%	%	%	%	1/1000	1/1000	POTENT.	1/1000
27-005-TP-1	1.62	50.6	3.74	46.9	0.09	1.23	0.30	38.4	17.2	-34.7								
27-005-WR-1	1.71	53.4	15.5	37.9	0.18	0.55	0.98			-1.67								

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
27-005-SW-1	0.987 J	2.97	2.57 U	9.7 U	6.83 U	1.67	35.1 J	0.180 JX	4.08 U	12.7 U	1.22 U	30.7 U	7.57 U	39.1
27-005-SW-2	4.43 J	4.63	14	9.7 U	6.83 U	2.77	45.2 J	0.210 JX	48.1	12.7 U	60.7 J	30.7 U	1030 J	41.7
27-005-SW-3	9.06 J	4.47	61.5	9.7 U	6.83 U	4.97	191 J	0.220 JX	175	12.7 U	82.3 J	30.7 U	5940 J	98.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
27-005-SW-1	55	< 5.0	< 5.0	0.07	NR
27-005-SW-2	53	< 5.0	8	0.1	NR
27-005-SW-3	152	< 5.0	42	0.07	NR

**LEGEND**

- SE1 - Upgradient of mine in Snowshoe Creek.  
 SE2 - Downstream of mine and most floodplain tailings.  
 TP1 - In floodplain near base of mine.  
 BACKGROUND - From Snowshoe Mine (27-005-SS-1).  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Discharge from pipe under dump.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Cherry Creek Millsite</u>	County: <u>Lincoln</u>
Legal Description: T <u>29N</u> R <u>31W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 27</u>
Mining District: <u>Libby</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 48° 14' 42"</u>	Primary Drainage: <u>Libby Creek</u>
Longitude: <u>W 115° 32' 50"</u>	USGS Code: <u>17010101</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Big Cherry Creek</u>
Quad: <u>Cable Mountain</u>	Date Investigated: <u>August 4, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>27-006</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 4,540 cubic yards. The tailings have been reclaimed and were moderately to well vegetated. The concentration of cyanide measured in the tailings was 0.867 mg/kg; additionally, the following elements were elevated at least three times background:

Arsenic: 546J mg/kg	Lead: 10,500 mg/kg
Cadmium: 22.5 mg/kg	Antimony: 39.2 mg/kg
Copper: 399 mg/kg	Zinc: 5,780 mg/kg
Mercury: 0.89 mg/kg	
- There were no adit discharges or seeps associated with this site. Big Cherry Creek flowed approximately 50 feet east of the site; however, no surface water samples were collected during the investigation. Three sediment samples were collected from Big Cherry Creek corresponding to upstream, probable point of entry, and downstream locations. An observed release to surface water was documented for arsenic in sediments.
- No groundwater samples were collected at this site during the investigation.
- The partially vegetated tailings that contained high concentrations of arsenic and lead were easily accessible by recreationalists.

Cherry Creek Mill PA# 27-006  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - TUESDAY  
 INVESTIGATION DATE: 08/04/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
27-006-SE-1	143 J	19.3	6.43	5.89	3.19	22.7	20500	0.02	777	9.55	795	6.82	616	NR
27-006-SE-2	470 J	22.4	15.4	7.44	3.49	33.8	62000	0.029	2720	8.07	1740	7.51	1150	NR
27-006-SE-3	199 J	16.7	8.57	5.12	2.79	42.7	40100	0.025	1790	7.11	1180	6.73 U	822	NR
27-006-TP-1	546 J	35.7	22.5	4.12	2.62	399	30300	0.89	384	5.39	10500	39.2	5780	0.867
BACKGROUND	54.2 J	18.5	1.23	9.23	1.59 U	29.4	21400	0.061	475	11.8	198	7.15 U	213	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL	NEUTRAL POTENTIAL	SULFUR POTENTIAL	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL	SULFUR ACID BASE POTENTIAL
27-006-TP-1	0.30	9.37	2.09	-7.28	0.14	0.11	0.05	3.44	-1.34

LEGEND

SE1 - Upgradient on Cherry Creek  
 SE2 - PFE to Cherry Creek  
 SE3 - Downgradient on Cherry Creek  
 TP1 - Sample of the subsample TP1A-B  
 BACKGROUND - From the Snowshoe Mine (27-005-SS-1)

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Boaz</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 1E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 19</u>
Mining District: <u>Norris/Red Bluff</u>	Mine Type: <u>Hardrock/Au, Pb, Zn, Ag</u>
Latitude: <u>N 45° 33' 35"</u>	Primary Drainage: <u>Hot Springs Creek</u>
Longitude: <u>W 111° 39' 16"</u>	USGS Code: <u>10020007</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Unnamed tributary of</u>
Quad: <u>Norris</u>	<u>Hot Springs Creek</u>
Inspectors: <u>M. Babits, S. Babits</u>	Date Investigated: <u>September 13, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>29-013</u>

- The volume of tailings associated with this site was estimated to be approximately 56,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 95.1J to 127J mg/kg	Cadmium: 12.8 to 18 mg/kg
Copper: 205 to 241 mg/kg	Mercury: 0.536J to 1.26J mg/kg
Manganese: 1,130 to 1,810 mg/kg	Lead: 3,030 to 4,800 mg/kg
Zinc: 1,710 to 2,440 mg/kg	Cyanide: 0.445 to 2.21 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 138,770 cubic yards. The following elements were elevated at least three times background:

Cadmium: 2.06 mg/kg	Manganese: 1,220 mg/kg
Lead: 576 mg/kg	Zinc: 399 mg/kg
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- An unnamed tributary to Hot Springs Creek flowed directly through the tailings at the site and eventually discharged into wetlands. Surface water and sediment samples were collected in the tributary upstream and downstream from the site. An observed release to the tributary was documented for lead; and the chronic aquatic life criteria for lead was exceeded in the downstream sample. The upstream sample indicated the presence of an upstream source.
- Two potentially hazardous open adits were identified at the site. The on site shaft had previously been grated by MDSL-AMRB.

Boaz PA# 29-013  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/13/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-013-SE-1	6.74 J	119	0.94 U	8.27	35.4	26.6	16400	0.114 J	190	25	6.75	6.5 UJ	50.3	NR
29-013-SE-2	16.7 J	70.9	1.66	5.52	14.8	38.3	10400	0.159 J	337	12.2	596	6.08 UJ	330	NR
29-013-TP-1	95.1 J	230	12.80	9.04	32.4	205	29600	0.536 J	1130	31.1	3030	6.41 UJ	1710	2.21
29-013-TP-2	127 J	303	18.00	11.6	41.1	241	40900	1.26 J	1810	35.2	4800	6.81 J	2440	0.445
29-013-WR-1	25.2 J	253	2.06	12.8	53.8	54.2	27200	0.157 J	1220	44	576	5.44 UJ	399	NR
BACKGROUND	11.4	105	0.4 U	12.8	34.3	31.3	22100	0.11 J	363 J	26.7	6.81 U	5.18 U	43.1	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	SULFUR ACID BASE v/1000	TOTAL NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000
29-013-TP-1	1.25	39	48.3	9.28	0.17	0.84	26.2	22.1
29-013-TP-2	0.68	21.2	45.3	24	0.09	0.45	14.1	31.2
29-013-WR-1	<0.01	0	51.4	51.4	0.05	<0.01	0	51.4

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
29-013-SW-1	3.69	102	4.59 U	5 U	6.24 U	3.47	1610	0.14 J	71.8	28.3	1.38	31.7 U	35	129
29-013-SW-2	3.9	95.6	4.59 U	5 U	6.24 U	2.33 U	73.1	0.12 U	5.27	10.9 U	15.6	31.7 U	13.8	142

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-013-SW-1	190	< 5	11	0.29	< 0.01
29-013-SW-2	196	< 5	11	0.05	< 0.01

LEGEND

SE1 - 180 feet upgradient from tailings pond 1.

SE2 - 10 feet downgradient from tailings pond 2.

TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, and TP-2A.

TP2 - Composite of subsamples TP1A-D, 1A-E, 1B-B, and TP-2B.

WR1 - Composite of subsamples WR1A, 1B, 2, and 3.

BACKGROUND - From the Grubstakes (29-399-SB-1).

SW1 - Same as SE1.

SW2 - Same as SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Grubstake</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 1E</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 19</u>
Mining District: <u>Norris/Red Bluff</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 33' 23"</u>	Primary Drainage: <u>Hot Springs Creek</u>
Longitude: <u>W 111° 38' 30"</u>	USGS Code: <u>10020007</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>South Fork Hot Springs Creek</u>
Quad: <u>Norris</u>	Date Investigated: <u>July 22, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-399</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 5,780 cubic yards of uncovered tailings at the site. The following were elevated at least 3 times background:
  - Arsenic: 52 to 63.4 mg/kg
  - Cadmium: 4 to 10 mg/kg
  - Copper: 101 to 148 mg/kg
  - Mercury: 0.331J mg/kg
  - Manganese: 1,360 mg/kg
  - Lead: 566 to 1,690 mg/kg
  - Zinc: 588 to 1,340 mg/kg
  - Cyanide: 22.3 to 40.3 mg/kg
- There were approximately 1,030 cubic yards of uncovered waste rock at the site. The following were elevated at least 3 times background:
  - Arsenic: 65 mg/kg
  - Cadmium: 4 mg/kg
  - Lead: 417 mg/kg
  - Zinc: 546 mg/kg
- There were no discharging adits at the site.
- An dry intermittent drainage was on the site. No surface water samples were collected, but sediment samples were collected. There were no observed releases to downstream sediments; however, cyanide was detected in one downstream sediment sample (SE-3).
- There was one open shaft at the site.

Grubstake PA# 29-398  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/22/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-398-SE-1	28.3	275	2.1	24.5	81.1	58.8	29200	0.246 J	711 J	78.3	81.1	5.51 U	133	NR
29-398-SE-2	14	125	1.6	12.4	28.4	36.5	16800	0.064 J	439 J	26.3	81	6 U	109	0.387
29-398-SE-3	20.6	228	1.6	19.2	48.4	54	27800	0.145 J	563 J	45.6	156	5.46 U	213	0.295 U
29-398-TP-1	52	117	4.3	11	34.9	54.3	21800	0.122 J	727 J	33	566	5.65 U	588	10.6
29-398-TP-2	63.4	267	9.9	18.3	51.2	148	36800	0.331 J	1360 J	55.3	1690	5.7 U	1340	40.3
29-398-TP-3	54.9	247	9.4	15.2	42.9	101	30600	0.189 J	994 J	38.8	1450	6.99 U	1220	22.3
29-398-WR-1	65	161	3.9	21.7	61.3	72.6	32500	0.289 J	901 J	65.3	417	5.33 U	546	NR
BACKGROUND	11.4	105	0.4 U	12.8	34.3	31.3	22100	0.11 J	363 J	26.7	6.81 U	5.18 U	43.1	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		TOTAL ACID BASE		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE		SULFUR ACID BASE	
	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000
29-398-TP-1	0.48	15		34.7		19.7		0.1		0.19		5.94		0.19		28.1		28.8		25.6
29-398-TP-2	0.53	16.6		53.8		37.2		<0.01		0.9		28.1		0.12		7.19		34.2		44.2
29-398-TP-3	0.57	17.8		41.3		23.5		0.19		0.23		4.69		0.15		4.69		44.2		44.2
29-398-WR-1	0.29	9.06		48.9		39.8		<0.01		0.15		4.69		0.15		4.69		44.2		44.2

LEGEND

- SE1 - Background sediment.
- SE2 - At outfall of culvert below tailings pond 5.
- SE3 - Next dam below tailings pond 5.
- TP1 - Composite of subsamples TP1A, 1B, 2A, and 3A.
- TP2 - Composite of subsamples TP2A and 5A.
- TP3 - Composite of subsamples TP3A and 5B.
- WR1 - Composite of subsamples WR1A, 1B, and 2.
- BACKGROUND - From the Grubstake (29-398-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Atlantic/Pacific</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>3W</u>	Section(s): <u>E 1/2, Sec. 20; W 1/2, Sec. 21</u>
Mining District: <u>Pony</u>	Mine Type: <u>Hardrock/Ag. Au</u>
Latitude: <u>N 45° 38' 50"</u>	Primary Drainage: <u>South Boulder River</u>
Longitude: <u>W 111° 59' 20"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Park Creek</u>
Quad: <u>Pony</u>	Date Investigated: <u>September 16 and 18, 1993</u>
Inspectors: <u>M. Babits, S. Babits, Flammang</u>	P.A. # <u>29-033</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 64,500 cubic yards. The following elements were elevated at least three times background:  
Lead: 69.9 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 19,000 cubic yards. The following elements were elevated at least three times background:  
Cobalt: 34.9 mg/kg                      Copper: 91 mg/kg  
Manganese: 6,710 mg/kg              Lead: 156 mg/kg
- A soil sample collected at the base of the heap leach pad revealed a cyanide concentration of 16.1mg/kg, and a water sample collected from a lined impoundment revealed 0.75 mg/l cyanide.
- One discharging adit was identified at the site. MCLs and acute and chronic aquatic life criteria were exceeded for cadmium and copper in the adit discharge. Additionally, the chronic aquatic life criteria for iron was exceeded. The adit discharge pH measurement was 3.6.
- Park Creek flowed adjacent to the site on the west site. Surface water and sediment samples were collected upstream and downstream from the site. An observed release to Park Creek was documented for lead. Acute and chronic aquatic life criteria for copper were exceeded in the downstream sample, and the chronic aquatic life criteria for lead was exceeded in the downstream sample.
- Three potentially hazardous open adits were identified at the site.

Atlantic & Pacific PA# 29-033  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/14/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-033-SE-1	6.04 U	36.9	1.2 U	3.42	12.7	19.1	6280	0.034 U	123 J	15.1	8.28 U	7.99 UJ	15	NR
29-033-SE-2	6.25 U	55.7	1.2 U	3.29	4.53	17.6	8190	0.038 U	256 J	7.5	8.57 U	8.27 UJ	8.9	NR
29-033-TP-1	5.16 U	103	1.0 U	2.31	1.93	21.8	10800	0.049	173 J	2.35 U	27	6.83 UJ	5.41	NR
29-033-TP-2	4.05 U	187	0.8 U	1.88	2.74	18	19000	0.099	85.8 J	1.99	69.9	5.35 UJ	6.19	0.102 U
29-033-WR-1	4.98	145	0.8 U	7.43	3.85	61.6	19400	0.025 U	521 J	5.71	158	5.31 UJ	13.6	NR
29-033-WR-2	4.78 U	256	0.9 U	34.9	1.37	91	15500	0.242	6710 J	7.08	17.8	6.3 UJ	15.7	NR
29-033-SS-1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	18.1
29-033-SS-2	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.609
BACKGROUND	20.1 J	168	0.8 U	10.7	31.5	29.2	21300	0.037 UJ	598	22	15.9	5.47 UJ	74.9	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %/1000R	TOTAL NEUTRAL POTENT. %/1000R	SULFUR ACID BASE POTENT. %/1000R	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE %/1000R	SULFUR ACID BASE POTENT. %/1000R
29-033-TP-1	0.1	3.12	6.78	3.65	<0.01	<0.01	0	6.78
29-033-TP-2	0.26	8.12	0.24	-7.9	<0.01	0.01	0.31	-0.07
29-033-WR-1	0.15	4.69	0.27	-4.4	0.05	<0.01	0	0.27
29-033-WR-2	0.14	4.37	0.41	-4	<0.01	<0.01	0	0.41

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-033-SW-1	1.29 J	23.4	4.59 U	5 U	6.24 U	6.37	50.8 JX	0.12 U	4.2	10.9 U	1.22 U	31.7 U	8.71 U	39.7
29-033-SW-2	5.81 J	31.1	4.59 U	5 U	6.24 U	12.6	79.2 JX	0.12 U	11.3	10.9 U	4.39 J	31.7 U	8.71 U	58.1
29-033-SW-3	3.38 J	16	7.37	158	6.24 U	2130	21200 JX	0.12 U	9220	29.3	3.59 J	31.7 U	112	172

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-033-SW-1	72	< 5	13	0.26	< 0.01
29-033-SW-2	124	< 5	25	0.43	< 0.01
29-033-SW-3	570	< 5	342	1.63	NR
29-033-SW-4	NR	NR	NR	NR	0.76

LEGEND

- SE1 - In Park Creek, 9' upstream of where road crosses creek.  
SE2 - In Park Creek, 30' downstream of spring that flows adjacent to tailings pond 1.  
TP1 - Composite of subsamples TP1AA, IAB, IBA, ICA, IDA, and IDB.  
TP2 - Composite of subsamples TP1BB, IBC, ICB, ICC, and IDC.  
WR1 - Composite of subsamples WR1A and IB.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From the Strawberry Mine (29-038-SS-1).  
SS1 - Base of heap leach nearest middle pond. Grab 0-6".  
SS2 - Composite of 3 holes in lysimeter field.
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Acid discharge at waste dump 2.  
SW4 - Middle pond, Southwest.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Boss Tweed</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>3W</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 15</u>
Mining District: <u>Pony</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Fe</u>
Latitude: <u>N 45° 39' 50"</u>	Primary Drainage: <u>North Willow Creek</u>
Longitude: <u>W 111° 57' 20"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Pony Creek</u>
Quad: <u>Pony</u>	Date Investigated: <u>September 14 and 15, 1993</u>
Inspectors: <u>M. Babits, S. Babits, Flammang</u>	P.A. # <u>29-034</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 65,900 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 2.7 to 9 mg/kg                      Copper: 95 to 518 mg/kg  
Mercury: 0.468J to 3.53J mg/kg      Lead: 91.7 to 327 mg/kg  
Zinc: 279 to 1,030 mg/kg
- A sample of leach pad material collected from this site revealed a cyanide concentration of 0.394 mg/kg.
- The volume of waste rock associated with this site was estimated to be approximately 26,520 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 5.6 to 13.3 mg/kg                      Copper: 146 to 195 mg/kg  
Mercury: 0.26J to 1.16 mg/kg                      Manganese: 2,340 to 2,990 mg/kg  
Lead: 138 to 1,870 mg/kg                      Zinc: 373 to 842 mg/kg
- Four discharging adits were identified at the site. One of the discharges was sampled for laboratory analysis. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria for zinc were exceeded. The chronic aquatic life criteria for mercury was also exceeded.
- Pony Creek flowed through the center of the site. Surface water and sediment samples were collected upstream and downstream from the site in Pony Creek. No MCLs were exceeded; the chronic aquatic life criteria for lead was exceeded in both the upstream and downstream samples. An observed release to Pony Creek (sediment) was documented for zinc.
- Potential safety hazards observed at the site included five open adits, a collapsing loadout structure, and three highwalls (>25 feet).

**Boss Tweed PA# 29-034**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 09/14/93**

**SOLID MATRIX ANALYSES**

Results per dry weight basis (mg/kg)

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
29-034-SE-1	17.7 J	55.6	1.3 U	7.71	21.8	13.5	14700	0.0347 UJ	486	12.7	9.34 U	9.01 UJ	44.7	NR
29-034-SE-2	8.05 J	27	2.2	4.72	5.5	93.6	12400	0.0877 J	619	6.21	34.4	7.39 UJ	206	NR
29-034-TP-1	11 J	55.7	2.3	5.62	28.4	95	24000	0.0853 J	1290	15.4	91.7	8 UJ	279	NR
29-034-TP-2	17.3 J	36	8.3	9.49	5.91	164	24500	0.468 J	745	8.58	327	8.42 UJ	1030	0.353
29-034-TP-3	8.96 J	15.8	5.0	6.49	7.25	354	20500	0.971 J	681	6.63	148	6.86 UJ	369	NR
29-034-TP-4	7.31 J	45.9	9.0	9.88	6.24	518	27600	3.53 J	1060	11	326	7.29 UJ	849	0.846
29-034-TP-5	4.45 U	103	2.7	7.05	13.4	32.6	14800	0.109 J	527	9.81	31.8	5.89 UJ	593	NR
29-034-WR-1	20.4 J	133	5.6	16.3	14.3	195	27900	1.16 J	2340	16.9	138	4.3 UJ	373	NR
29-034-WR-2	13.6 J	237	13.3	11.4	5.43	154	31500	0.838 J	2990	11.6	139	5.26 UJ	842	NR
29-034-WR-3	37.9 J	112	2.3	6.48	9.78	146	29200	0.26 J	439	6.26	1870	5.49 UJ	99.8	NR
29-034-LP-1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.394
BACKGROUND	20.1 J	168	0.8 U	10.7	31.5	29.2	21300	0.0367 UJ	596	22	15.9	5.47 UJ	74.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC ACID BASE %	PYRITIC SULFUR %	SULFUR ACID BASE POTENT. %
29-034-TP-1	0.23	7.19	67.3	60.1	0.06	3.75	63.6	
29-034-TP-2	1.11	34.7	29.2	-5.45	0.07	26.2	2.98	
29-034-TP-3	0.92	28.7	27.8	-0.97	0.11	15	12.8	
29-034-TP-4	1.03	32.2	34.1	1.96	0.12	19.1	15.1	
29-034-TP-5	0.09	2.81	7.05	4.23	0.04	0.31	6.73	
29-034-WR-1	1.17	36.8	64.5	27.9	0.51	26.9	37.6	
29-034-WR-2	0.28	8.75	39.6	30.9	0.17	0	39.6	
29-034-WR-3	0.58	18.1	2.05	-16.1	<0.01	0.31	1.74	
29-034-WR-3	0.58	17.5	2.45	-15	<0.01	0.31	2.13	

**WATER MATRIX ANALYSES**

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-034-SW-1	7.82	15.5	4.59 U	5 U	6.24 U	2.33 U	576	0.12 J	28.1	10.9 U	4.99	31.7 U	8.71 U	47.3
29-034-SW-2	1.12 U	13.7	4.59 U	5 U	6.24 U	2.57	195	0.12 U	19.3	10.9 U	3.55	31.7 U	8.71 U	93.7
29-034-SW-3	4.1	3.23	4.59 U	5 U	6.24 U	12	235	0.13 J	394	10.9 U	1.37	31.7 U	250	139
29-034-SW-4	1.41	1.1 U	4.59 U	5 U	6.24 U	2.33 U	13.7 U	0.12 U	3.76 U	10.9 U	1.25	31.7 U	8.71 U	0.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-034-SW-1	96	< 5	< 5	0.1	NR
29-034-SW-2	160	< 5	49	0.44	< 0.005
29-034-SW-3	217	< 5	89	0.58	NR
29-034-SW-4	NR	NR	NR	NR	< 0.005

**LEGEND**

LP1 - Small leach pond by WR2.

TP1 - Composite of subsamples TP1A-A through 1A-F, 1B-A through 1B-C, and 2A

TP2 - Composite of subsamples TP1A-D, 1A-E, 1B-D, and 1B-E.

TP3 - Composite of subsamples TP2A-A, 2A-B, 2A-C, 2B-A, 2B-B and 2B-C.

TP4 - Composite of subsamples TP3B-A, 3B-B, 3A-A, 3A-B, and 3A-C.

TP5 - Composite of subsamples TP3B-C and 3A-D.

WR1 - Composite of subsamples WR1, 2, and 3.

WR2 - Composite of subsamples WR3, 4, 5, 6, 7, and 8.

WR3 - Composite of subsamples WR9A, 9B, and 10.

BACKGROUND - From the Strawberry Mine (29-034-SS-1)

SE1 - 500 feet upgradient from waste rock dump 6 in Pony Creek

SE2 - Downgradient of TP3 prior to confluence with tributary

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW3 - Acid discharge at WR1.

SW4 - QA/QC Blank.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Garnet Gold Mine</u>	County: <u>Madison</u>
Legal Description: <u>T 2S R 3W</u>	Section(s): <u>SE 1/4, Section 23</u>
Mining District: <u>Pony</u>	Mine Type: <u>Hardrock/Au. Cu. Ag. Zn. Pb</u>
Latitude: <u>N 45° 38' 42"</u>	Primary Drainage: <u>North Willow Creek</u>
Longitude: <u>W 111° 56' 07"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Cataract Creek</u>
Quad: <u>Pony</u>	Date Investigated: <u>July 8, 1994</u>
Inspectors: <u>Flammang, Belanger, West</u>	P.A. # <u>29-035</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of mill tailings observed at the site was estimated to be 23,450 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 8.1 to 14.6 mg/kg	Lead: 2,160 to 5,380 mg/kg
Barium: 471 mg/kg	Copper: 306 to 1,290 mg/kg
Mercury: 0.76J to 0.82J mg/kg	
- The volume of waste rock observed at the site was estimated to be 21,640 cubic yards. The following elements were elevated to at least three times the background concentrations:

Copper: 105 to 194 mg/kg	Lead: 351 to 515 mg/kg
Mercury: 0.29J to 0.34J mg/kg	
- One discharging adit was observed at the site. MCLs for cadmium and antimony were exceeded in the adit discharge. In addition, acute and chronic aquatic life criteria for copper and zinc and chronic aquatic life criteria for cadmium and lead were exceeded in the adit discharge.
- Cataract Creek flows directly through tailings at the site. Observed releases to Cataract Creek (sediment) were documented for copper, mercury, and lead.
- No MCLs were exceeded in Cataract Creek; however, the chronic aquatic life criteria for lead was exceeded in the downstream sample.
- Potential safety hazards observed at the site included two partially accessible adits and an open shaft.

Garnet Gold Mine PA# 29-035  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/09/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-035-SE1	0.4 U	3.9 U	26.6	0.4 U	1.4	2.8	4.9	5740	0.02 UJ	468	2.0	15.4	4.3 U	18.4	NR
29-035-SE2	0.7	5.9 U	75.5	0.6 U	1.9 U	2.5	149	5470	0.24 J	45.5	1.8 UJ	861	6.6 U	46.4	NR
29-035-TP1	8.1	5.8 U	196	0.8 U	1.9 U	1.0 U	308	9170	0.76 J	79.9	1.8 UJ	2160	6.5 U	109	NR
29-035-TP2	14.6	4.5 U	471	0.4 U	1.5 U	0.8 U	1290	10200	0.82 J	41.4	1.4 UJ	5380	5.0 U	110	NR
29-035-WR1	1.2	5.4 U	77.2	0.5 U	2.6	1.0 U	194	15900	0.29 J	1240	1.6 UJ	515	6.0 U	80.6	NR
29-035-WR2	0.5 U	5.1 U	42.4	0.5 U	2.4	1.4	105	7730	0.34 J	842	1.5 UJ	351	5.7 U	69.4	NR
BACKGROUND	0.6 U	5.9 U	140	0.6 U	3.6 B	9.2	12.3	11000	0.06 J	735	4.7 B	34.0	6.6 U	55.5	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE		POTENT. V/1000
	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	%	V/1000	
29-035-TP1	0.12	3.75	0.06	-3.7	0.12	-3.7	<0.01	0.00	<0.01	0.00	0.00	0.00	0.00	0.06	
29-035-TP2	0.25	7.81	0.56	-7.3	0.2	-7.3	0.03	0.94	0.02	0.94	0.31	0.31	0.06	-0.38	
29-035-WR1	0.29	9.06	3.53	-5.5	0.22	-5.5	0.01	0.06	0.06	0.31	0.31	0.31	0.06	3.22	
29-035-WR2	0.05	1.56	6.27	4.71	0.02	4.71	0.01	0.02	0.02	0.31	0.31	0.31	0.02	5.96	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
29-035-AD1	0.12 U	1.2	27.2	8.2	8.7 U	4.7 U	205	241	0.11 U	4000	8.0 U	43.5 J	34.0 JX	440 JX	227
29-035-SW2	0.12 U	1.1 U	25.0	2.6 U	8.7 U	4.7 U	4.6 U	124	0.11 U	13.6	8.0 U	19.6 J	29.4 UX	4.9 JX	33.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-035-AD1	343	<5.0	157	0.11	NR
29-035-SW2	25	<5.0	<5.0	0.14	NR

LEGEND

- SE1 - Upgrades of this, approx. 30' below surface down flow.  
SE2 - Downgrades of forest bench down approx. 30'.  
TP1 - Composite of subamples TP1A, 1B, 1C, 1, and 1D-1.  
TP2 - Composite of subamples TP1C-2 and 1D-2.  
WR1 - Composite of subamples WR1A through 1D.  
WR2 - Composite of subamples WR1A, 1B, and 4.  
BACKGROUND - From the Garnet Gold Mine (29-035-SE1).

AD1 - Discharge from cell #1.  
SW2 - Same as sample 29-035-SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Strawberry</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>3W</u>	Section(s): <u>N 1/2, NE 1/4, Sec. 14</u>
Mining District: <u>Pony</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 39' 50"</u>	Primary Drainage: <u>North Willow Creek</u>
Longitude: <u>W 111° 55' 50"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Pony Creek</u>
Quad: <u>Pony</u>	Date Investigated: <u>September 14, 1993</u>
Inspectors: <u>M. Babits, S. Babits, Flammanq</u>	P.A. # <u>29-038</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 13,475 cubic yards. The following elements were elevated at least three times background:  
Copper: 167 to 294 mg/kg      Cadmium: 1.8 mg/kg  
Mercury: 1.17J to 1.94J mg/kg      Lead: 367 to 584 mg/kg  
Zinc: 360 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 12,820 cubic yards. The following elements were elevated at least three times background:  
Copper: 155 to 275 mg/kg      Cadmium: 1.6 to 2.8 mg/kg  
Mercury: 0.218J to 0.882J mg/kg      Lead: 266 to 1,510 mg/kg  
Zinc: 278 mg/kg
- One discharging adit was identified at the site during the investigation. The MCL for cadmium was exceeded in the adit discharge. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, and zinc.
- Pony Creek was flowing through the center of the site during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Pony Creek. No MCLs were exceeded; however, the chronic aquatic life criteria for mercury was exceeded in both the upstream and downstream samples.
- Ten potentially hazardous open adits and four open shafts were identified at the site.

Strawberry PA# 29-038  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 09/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-038-SE-1	11.6 J	29.6	1.5	4.04	7.65	77.7	12700	0.113 J	555	12.1	43.7	7.8 UJ	206	NR
29-038-SE-2	5.81 J	55	1.7	7.96	15.4	45.7	13200	0.063 J	470	14.1	21.9	5.95 UJ	140	NR
29-038-TP-1	23.2 J	141	1.8	11.9	40.6	294	21300	1.17 J	330	39.5	367	7.33 UJ	360	NR
29-038-TP-2	26.1 J	139	1.0 U	2.25	9.27	167	20800	1.94 J	52	4.87	584	6.71 UJ	172	1.42
29-038-WR-1	32 J	83.3	2.8	18.8	39.7	275	29500	0.218 J	478	33.4	1510	7 J	278	NR
29-038-WR-2	40.6 J	177	1.6	12.5	36.3	155	36800	0.882 J	415	36.3	266	5.01 UJ	142	NR
BACKGROUND	20.1 J	168	0.8 U	10.7	31.5	29.2	21300	0.037 UJ	596	22	15.9	5.47 UJ	74.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
29-038-TP-1	<0.01	0	77.6	77.6	<0.01	<0.01	<0.01	<0.01	0.01	0	0.01	0.03	0.31	0.03	77.6	77.6
29-038-TP-2	0.34	10.6	0.34	-10	0.01	0.33	0.31	0.01	<0.01	0.31	<0.01	0.08	0.31	0.08	0.31	0.03
29-038-TP-2DUP	0.32	10	0.39	-9.6	0.01	0.31	0.01	0.01	<0.01	0.31	<0.01	0.03	0.31	0.03	0.31	0.03
29-038-TP-2	0.34	10.6	0.34	-10	0.01	0.33	0.31	0.01	<0.01	0.31	<0.01	0.03	0.31	0.03	0.31	0.03
29-038-WR-1	0.07	2.19	5.38	3.19	0.01	0.05	0.01	0.01	0.01	0.31	0.01	5.06	0.31	5.06	1.94	1.94
29-038-WR-2	0.45	14.1	2.26	-12	0.01	0.44	0.01	0.01	<0.01	0.31	<0.01	1.94	0.31	1.94	0.31	1.94

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-038-SW-1	2.82	13.1	4.59 U	5 U	6.24 U	2.33 U	66.5	0.12 U	4.6	10.9 U	1.35	31.7 U	8.71 U	75.5
29-038-SW-2	3.37	16.5	4.59 U	5 U	6.24 U	2.33 U	268	0.23 J	43	10.9 U	1.64	31.7 U	24	87.2
29-038-SW-3	4.86	38.1	12.9	36.7	6.37	77.7	12000	0.16 J	1750	81.4	1.61	31.7 U	762	276

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-038-SW-1	164	< 5	31	0.3	NR
29-038-SW-2	151	< 5	40	0.4	NR
29-038-SW-3	401	< 5	187	0.37	NR

LEGEND

- SE1 - 250 feet upstream of mine access road Pony Creek crossing.  
SE2 - 1200' downstream of mill ruins below last tailings.  
TP1 - Composite of subsamples TP1A-A 1A-B, 2A-A, 2A-B, 2C-A, 2B-A, and 2B-C.  
TP2 - Composite of subsamples TP1A-C, 1A-D, 1A-E, and 2B-C.  
WR1 - Composite of subsamples WR1, 2, 3A, and 3B.  
WR2 - Composite of subsamples WR4A, 4B, 6, 7, 8, and 9.  
BACKGROUND - From the Strawberry Mine (29-038-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Add discharge at waste rock dump 9.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Chicago Mining Corp. Pony</u>	County: <u>Madison</u>
<u>Millsite</u>	Section(s): <u>SE 1/4. SE 1/4. Section 13: SW 1/4.</u>
Legal Description: <u>T 2S R 3W; T 2S R 2W</u>	<u>SW 1/4. Section 18</u>
Mining District: <u>Pony</u>	Mine Type: <u>Millsite/Au</u>
Latitude: <u>N 45° 39' 27"</u>	Primary Drainage: <u>North Willow Creek</u>
Longitude: <u>W 111° 54' 17"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>North Willow Creek</u>
Quad: <u>Pony</u>	Date Investigated: <u>August 11, 1994</u>
Inspectors: <u>Tuesday, Belanger, West</u>	P.A. # <u>29-500</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No samples were collected at this site during the 1994 inventory; the team was unable to enter the locked premises.
- One tailings pond was observed at the site; however, the tailings were not bored or sampled. and the volume is unknown.
- Cyanide has been detected in the groundwater downgradient from this facility in a spring and a residential well. Cyanide concentrations detected in November of 1994 did not exceed drinking water standards.
- No discharging adits or filled shafts were observed at the site.
- Pony Creek flows adjacent to the site on the north side, and North Willow Creek flowed adjacent to the site on the southeast side. Surface water data collected in 1994 indicated that no metals were elevated downstream in North Willow Creek compared to upstream concentrations. No 1994 surface water data was available for Pony Creek downstream from the site.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Emma</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 7W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 6</u>
Mining District: <u>Rochester</u>	Mine Type: <u>Hardrock/Au, Pb, Ag, Zn</u>
Latitude: <u>N 45° 34' 37"</u>	Primary Drainage: <u>Big Hole River</u>
Longitude: <u>W 112° 02' 19"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Nez Perce Creek</u>
Quad: <u>Nez Perce Hollow</u>	Date Investigated: <u>June 18, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-061</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 11,700 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3,710 to 5,840 mg/kg	Cadmium: 115JX to 495JX mg/kg
Copper: 492 to 1,440 mg/kg	Mercury: 0.199 to 0.5 mg/kg
Lead: 8,990 to 29,500 mg/kg	Antimony: 95J to 194J mg/kg
Zinc: 7,400 to 46,200 mg/kg	
  
- The volume of waste rock associated with this site was estimated to be approximately 15,185 cubic yards. The following elements were elevated at least three times background:

Arsenic: 9,500 to 11,900 mg/kg	Cadmium: 82.3JX to 206JX mg/kg
Copper: 552 to 870 mg/kg	Mercury: 1.08 to 3.88 mg/kg
Manganese: 2,030 mg/kg	Lead: 27,500 to 41,200 mg/kg
Antimony: 40J to 100J mg/kg	Zinc: 9,100 to 9,200 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
  
- No surface water was identified on or near the site. The nearest flowing water was approximately one mile away; consequently, no surface water or sediment samples were collected.
  
- Potentially hazardous mine openings identified at the site included one open shaft and four open adits.

Emma PA# 29-061  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/18/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-061-TP-1	3710	29.9	115 JX	7.8	9	492	46700	0.5	727	21	8990	95 J	7400	NR
29-061-TP-2	5840	33.7	495 JX	16.2	7	1440	59600	0.199	1370	33	29500	194 J	46200	NR
29-061-WR-1	2910	157	72.8 JX	17.4	20.5	160	38200	1.99	1670	33	6200	34 J	4490	NR
29-061-WR-2	9500	30.5	82.3 JX	10.8	5.4	552	61100	1.08	943	22	27500	100 J	9100	NR
29-061-WR-3	11900	30	206 JX	21.7	5.5	870	54600	3.88	2030	23	41200	40 J	9200	NR
BACKGROUND	56	169	0.8 JX	13.8	29.4	34.2	25300	0.014 U	462	26	30	4 UJ	119	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Acid/Base Accounting

Acid/Base Accounting												
FIELD ID	TOTAL		SULFUR		NEUTRAL.		SULFUR		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000x	POTENT. v/1000x	ACID BASE POTENT. v/1000x	SULFATE %	PYRITIC %	ORGANIC %	ACID BASE v/1000x	POTENT. v/1000x	SULFUR %	ACID BASE v/1000x	POTENT. v/1000x
29-061-TP-1	1.51	47.2	6.08	-41	1.01	0.19	0.31	5.94	0.14			
29-061-TP-2	5.99	187	23.3	-164	<0.01	4.34	2.44	136	-112			
29-061-WR-1	0.04	1.25	40.1	38.9	0.03	<0.01	0.01	0	40.1			
29-061-WR-2	3.41	107	4.61	-102	1.25	0.78	1.38	24.4	-19.8			
29-061-WR-3	0.44	13.7	15.2	1.47	0.41	<0.01	0.05	0	15.2			

LEGEND

TP1 - Composite of subsamples TP1B-A, 1A-A, and 1A-B.  
TP2 - Composite of subsamples TP1A-C and 1A-D.  
WR1 - Composite of subsamples WR1A-A, 1B, and 6.  
WR2 - Composite of subsamples WR2A, 2B, 2C, 4A, and 4B.  
WR3 - Sample of the WR5 subsample.  
BACKGROUND - On top of the hill, upgradient of waste rock dump 6. From the Emma Mine (29-061-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Thistle Mine and Millsite</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 7W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 5</u>
Mining District: <u>Rochester</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 45° 37' 27"</u>	Primary Drainage: <u>Rochester Creek</u>
Longitude: <u>W 112° 29' 28"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Rochester Creek</u>
Quad: <u>Twin Bridges</u>	Date Investigated: <u>June 15, 1993</u>
Inspectors: <u>Tuesday, Babits, Belanger,</u>	P.A. # <u>29-073</u>
<u>Lasher, Clark/Pierson</u>	
Organization: <u>Pioneer Technical Services,</u>	
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 56,950 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2,730 to 6,850 mg/kg	Cadmium: 3.8 to 10.5 mg/kg
Copper: 371 to 887 mg/kg	Mercury: 0.255 to 3.51 mg/kg
Lead: 2,500 to 5,850 mg/kg	Antimony: 27 to 59 mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 6,393 cubic yards. The following elements were elevated at least three times background:

Arsenic: 275 mg/kg	Cadmium: 4.3 to 37.3 mg/kg
Mercury: 0.366 to 2.21 mg/kg	Manganese: 1,610 mg/kg
Lead: 309 to 1,720 mg/kg	Zinc: 1,720 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
  
- Intermittent Rochester Creek was situated adjacent to the tailings at the site. Sediment samples were collected upstream and downstream from the site. Observed releases to Rochester Creek (sediment) were documented for arsenic, cadmium, mercury, and lead.
  
- Potentially hazardous mine openings identified at the site included four open shafts and six open adits.

**Thistle PA# 29-073**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE:**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Ct (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-073-SE-1	124	83.1	0.5	4.3	21.8	83.7	12800	0.015	130	11	71	< 3	32	NR
29-073-SE-2	590	49.9	1.6	4.9	14.7	162	19600	0.087	189	13	650	6	64	NR
29-073-SE-3	291	52.7	< 0.6	6.9	18.1	66.7	20400	< 0.024	131	17	204	< 4	43	NR
29-073-TP-1A	2730	39	3.8	3.9	4.5	371	32300	0.255	67.4	6	2500	27	100	NR
29-073-TP-1B	6850	97.9	10.5	6	18.1	887	67300	3.51	122	10	5850	59	117	NR
29-073-WR-1	13	61.3	4.3	13.7	28.4	30.8	36100	0.366	738	26	309	< 3	187	NR
29-073-WR-2	275	68.5	37.3	31.8	38.3	67.7	45900	2.21	1610	53	1720	< 4	1720	NR
BACKGROUND	19	144	0.6	14.1	47.5	32.6	26800	0.02 J	481	29	30	< 3 UJ	74	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Reported

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
29-073-TP-1A	1.15	-6.7	-43	0.15	0.15	4.69	-11.4
29-073-TP-1B	1.23	-2.9	-41	0.01	0.06	0.31	-3.26
29-073-WR-1	0.1	70.7	67.6	0.02	0.1	0.62	70.1
29-073-WR-2	0.14	74.6	70.2	0.02	0.11	0.62	74

**LEGEND**

SE1 - Upstream of tailings in Rochester Creek  
SE2 - At breach where tailings flow into creek  
SE3 - Downstream from tailings impoundment in Rochester Creek  
TP1A - Composite of subsamples TP1C-A, 1C-B, 1C-C, and 1D-A  
TP1B - Composite of subsamples TP1A-A, 1A-C, 1B-A, and 1D-B  
WR1 - Composite of subsamples WR1A and 12  
WR2 - Composite of subsamples WR1B, 11, 13, 14, and 15  
BACKGROUND - Above WR15. From the Thistle Mine (29-073-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Watseca</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>7W</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 32; NE 1/4, SE 1/4, SEC. 31</u>
Mining District: <u>Rochester</u>	Mine Type: <u>Hardrock/Ag, Au, Cu, Zn</u>
Latitude: <u>N 45° 37' 15"</u>	Primary Drainage: <u>Big Hole River</u>
Longitude: <u>W 112° 30' 15"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Rochester Creek</u>
Quad: <u>Nez Perce Hollow</u>	Date Investigated: <u>September 20, 1993</u>
Inspectors: <u>Bullock, Tuesday, Flammang</u>	P.A. # <u>29-075</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The site was active, apparently operating under a Small Miner Exclusion.
- The Thistle I tailings (PA# 29-073) and waste rock from the Watseca dumps were being reprocessed in a cyanide vat leach operation. The tailings impoundment was lined with geotextile and process water appeared to be recycled. No samples were collected.
- There were no discharging adits on site.
- There was no surface water on site; no surface water samples were collected. The nearest surface water was Rochester Creek, an intermittent drainage approximately 100 feet from the facility. The drainage was dry at the time of this investigation.
- There was one hazardous open shaft on site. Several other shafts have been grouted by the AMRB.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Smuggler</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 4W</u>	Section(s): <u>SE 1/4, SW 1/4, SW 1/4, Sec. 13</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 28' 57"</u>	Primary Drainage: <u>Mill Creek</u>
Longitude: <u>W 112° 02' 18"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Mill Creek</u>
Quad: <u>Copper Mountain</u>	Date Investigated: <u>June 16, 1993</u>
Inspectors: <u>Tuesday, Babits, Belanger, Lasher, Clark/Pierson</u>	P.A. # <u>29-010</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 3,000 cubic yards. Approximately 80% of the tailings surface was naturally revegetated. The following elements were elevated at least three times background:  
Cadmium: 3.9J mg/kg      Lead: 504 mg/kg  
Mercury: 2.51 mg/kg      Zinc: 435 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 8,500 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 6.6 mg/kg      Lead: 514 mg/kg  
Mercury: 0.207J mg/kg      Zinc: 1,030 mg/kg
- Four adits were associated with this site; however, only one of the adits (Adit #1) was discharging water. The Adit #1 discharge was very minor (<1 gpm), and eventually seeped into the ground. The discharge did not exceed any MCL/MCLGs; however, the chronic aquatic life criteria for mercury was exceeded.
- Mill Creek was located approximately 200 yards downgradient from the adits and associated waste rock dumps, and approximately 20 yards downgradient from the tailings on the opposite side of the Mill Creek Road. Mill Creek was not sampled during the investigation.
- Adit #4 was open and posed a hazard.

Smuggler PA# 29-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-010-TP-1	36	14.8	3.9 J	14.8	30.2	58.4	25700	2.51	703	41	504	4 UJ	435	NR
29-010-WR-1	29	26.1	6.6	22.9	74.6	71.7	37100	0.207 J	1220	78	514	3 UJ	1030	NR
BACKGROUND	20	96.4	1.2 JX	20.2	42.1	35.1	18200	0.017 U	608	59	25	4 UJ	61	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	NEUTRAL POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFATE %	PYRITIC %	SULFUR %	POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFUR 1/1000
29-010-TP-1	0.07	2.19	49.2	47	0.01	0.02	0.04	0.62	48.6	
29-010-WR-1	0.31	9.68	115	105	<0.01	0.14	0.24	4.37	111	

Cation Exchange Capacity

FIELD ID	milliequivalents/100g
29-010-TP-1	2.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-010-SW-1	1.69 U	7.13	2.55 U	5.99 U	5 U	1.93 J	46.2	0.26	2.6 U	10.5 J	1.55 U	18.3 U	19.6	186

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-010-SW-1	234	< 5.0	19	0.13	NR

LEGEND

TP1 - Composite of the subsamples TP1A and 1B.  
WR1 - Composite of the subsamples WR1A through 1C, and 3A, and 3B.  
BACKGROUND - From the Uncle Sam Mine (29-383-S5-1).  
SW1 - Acid discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Goldschmidt/Steiner</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 4W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 25</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 27' 10"</u>	Primary Drainage: <u>Ramshorn Creek</u>
Longitude: <u>W 112° 02' 40"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Currant Creek</u>
Quad: <u>Copper Mountain</u>	Date Investigated: <u>August 25, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>29-078</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 6,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 164 mg/kg	Cadmium: 7.79J to 74.9J mg/kg
Copper: 112 mg/kg	Mercury: 0.49J to 1.01J mg/kg
Manganese: 2,390J to 8,800J mg/kg	Nickel: 191JX mg/kg
Lead: 403JX to 1,500JX mg/kg	Antimony: 8.53J to 37.1J mg/kg
Zinc: 885J to 8,890J mg/kg	
- No discharging adits, filled shafts, seeps, or springs were identified at the site during the investigation.
- Currant Creek was flowing through the center of the site during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Currant Creek. No MCLs were exceeded; however, chronic aquatic life criteria for mercury and lead were exceeded in both the upstream and downstream samples.
- Observed releases to Currant Creek (sediment) were documented for mercury, manganese, nickel, lead, and zinc.
- Eight potentially hazardous open adits were identified at the site.

**Goldschmidt-Stelner PA# 29-078**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/26/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-078-SE-1	7.52 U	129 J	1.4 U	10.3	60.2	20	15000	0.054 U	481	29.6 J	10.3 U	9.95 U	67.6	NR
29-078-SE-2	14.7	535 J	1.6	46.2	82.7	55.1	25100	0.208 J	2730	101 J	80.1	6.34 U	208	NR
29-078-WR-1	32.9	139 J	10.2	37.2	54.1	78.8	27900	0.557 J	3350	100 J	1150	6.98 U	953	NR
29-078-WR-2	19.7	228 J	7.79 J	30.8	72.3 JX	57.6	35000	1.01 J	8800 J	191 JX	403 JX	8.53 J	885 J	NR
29-078-WR-3	164	41.7 J	74.90 J	59.9	45.4 JX	112	39700	0.49 J	2390 J	133 JX	1500 JX	37.1 J	8890 J	NR
BACKGROUND	20	96.4	1.2 JX	20.2	42.1	35.1	18200	0.017 U	608	59	25	4 U	61	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	1/1000	POTENT.	1/1000	POTENT.	%	SULFUR	%	1/1000	%	SULFUR	%	1/1000	POTENT.	1/1000
29-078-WR-1	<0.01	0	21.4	177	21.4	177	<0.01	0.01	<0.01	0.01	<0.01	0.01	0.31	21.1	0	177
29-078-WR-2	<0.01	0	177	50.1	177	46.7	<0.01	0.01	<0.01	0.01	0.05	0.05	0.31	49.8		
29-078-WR-3	0.11	3.44	50.1													

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-078-SW-1	0.96 U	42.8	2.57 U	9.7 U	6.83 U	1.55 U	278	0.14 JX	41.4	19.1	4.53 J	30.7 U	10.7 J	59.2
29-078-SW-2	0.96 U	44.1	2.57 U	9.7 U	6.83 U	1.55 U	501	0.2 JX	45	12.7 U	2.86 J	30.7 U	17.4 J	69.4

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-078-SW-1	107	< 5.0	< 5	0.33	NR
29-078-SW-2	111	< 5.0	< 5	0.31	NR

**LEGEND**

- SE1 - 250' upgradient from cabin in Current Creek  
 SE2 - 100' downgradient from waste rock dump 1 in Current Creek  
 WR1 - Composite of subsamples WR1, 9A, 9B, and 9C.  
 WR2 - Composite of subsamples WR4, 7, and 3.  
 WR3 - Composite of subsamples WR10A, 10B, 10C, and 13.  
 BACKGROUND - From Uncle Sam Mine (29-383-S5-1).
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Red Pine</u>	County: <u>Madison</u>
Legal Description: T <u>4S</u> R <u>4W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 3</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au, Cu</u>
Latitude: <u>N 45° 31' 20"</u>	Primary Drainage: <u>Indian Creek</u>
Longitude: <u>W 112° 05' 05"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Unnamed tributary to</u>
Quad: <u>Noble Peak</u>	<u>Indian Creek</u>
Inspectors: <u>Babits, Flammanq/Pierson</u>	Date Investigated: <u>August 25, 1993</u>
Organization: <u>Pioneer Technical Services,</u>	P.A. # <u>29-079</u>
<u>Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 4,450 cubic yards. The following elements were elevated at least three times background:  
Copper: 236 to 298 mg/kg      Mercury: 0.432J to 0.442J mg/kg  
Antimony: 11.8J to 30.4J mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 25,000 cubic yards. The following elements were elevated at least three times background:  
Copper: 408 mg/kg      Mercury: 0.453J mg/kg  
Antimony: 42.7J mg/kg
- One discharging adit was identified at the site during the investigation. No MCLs were exceeded in the adit discharge; however, chronic aquatic life criteria were exceeded for mercury and lead. This discharge eventually flowed into Indian Creek.
- Indian Creek was flowing south of the site during the investigation; however, surface water samples were not collected due to extremely high flow and likely excessive dilution. Indian Creek sediment samples were collected upstream and downstream from the site; metals concentrations were not significantly elevated in the downstream sample.
- One potentially hazardous open adit was identified at the site.

Red Pine PA# 29-079  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/25/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-079-SE-1	5.96	42.3 J	1.04 UJ	9.92	38.6 JX	39.1	13600	0.039 UJ	460 J	28 JX	7.4 UJX	7.14 UJ	64.9 J	NR
29-079-SE-2	9.58	51.5 J	1.21 UJ	10.4	44.6 JX	43.4	14900	0.032 UJ	931 J	34.4 JX	8.68 UJX	8.38 UJ	58.2 J	<0.334
29-079-TP-1	62.7	193 J	0.97 UJ	17.4	26.5 JX	236	43900	0.432 J	3150 J	48.3 JX	27.8 JX	11.8 J	61.3 J	NR
29-079-TP-2	68.2	125 J	0.99 UJ	17.9	29.9 JX	298	43200	0.442 J	2950 J	42.1 JX	38.1 JX	30.4 J	74.6 J	<0.290
29-079-TP-3	5.18 U	83.6 J	0.99 UJ	10.5	31.6 JX	42.5	19000	0.032 J	1510 J	26.3 JX	7.09 UJX	6.85 UJ	40.3 J	<0.284
29-079-WR-1	64.5	39.2 J	0.80 UJ	19.5	12.6 JX	408	39600	0.453 J	3420 J	35 JX	14 JX	42.7 J	75.4 J	NR
BACKGROUND	26	154	8.6 JX	15.3	26.1	29.6	20200	0.021	1240	43	89	4 UJ	70	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE %	SULFUR POTENT. %
29-079-TP-1	0.7	21.9	346	324	0.31	0.84	20	326
29-079-TP-2	0.84	20	184	164	0.04	0.39	12.2	172
29-079-TP-3	0.06	1.87	32.6	30.7	0.03	0.01	0.31	32.2
29-079-WR-1	3.8	119	379	260	3.88	2.39	74.7	304

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-079-SW-3	1.07	5.73	2.57 U	9.7 U	6.83 U	1.55 U	43.1	0.21 JX	5.47	12.7 U	2.24 J	30.7 U	10.9 J	50.7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

Field ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-079-SW-3	90	< 5.0	< 5	0.07	NR

LEGEND

- SE1 - In Indian Creek, 75' up from confluence with adit discharge.  
SE2 - In Indian Creek at PPE of tailings pond 3.  
TP1 - Composite of subsamples TP1AA through 1AC, 1BA, 2AA through 2AC, and 3A through 3C.  
TP2 - Composite of subsamples TP1BB through 1BE.  
TP3 - Composite of subsamples TP2AD and 3D.  
WR1 - Composite of subsamples WR1A through 1C.  
BACKGROUND - From NW SE Sec. 26 (29-476-SS-1).  
SW3 - Discharging adit at waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Broadgauge</u>	County: <u>Madison</u>
Legal Description: T <u>4S</u> R <u>4W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 17</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 28' 56"</u>	Primary Drainage: <u>Mill Creek</u>
Longitude: <u>W 112° 08' 04"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Spring Park Creek</u>
Quad: <u>Sheridan</u>	Date: <u>June 16, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>29-293</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with the site was estimated to be approximately 2,100 cubic yards (WR-1 was located in an intermittent drainage). The following elements were elevated at least three times background:

Arsenic: 208 to 257 mg/kg	Cadmium: 9.3J mg/kg
Iron: 59,400 mg/kg	Manganese: 1620 to 1630 mg/kg
Nickel: 73 to 109 mg/kg	Lead: 231 to 2660 mg/kg
Zinc: 1900 mg/kg	
- There was one adit discharge observed at the site during the investigation. No MCLs or acute or chronic aquatic life criteria were exceeded in the adit discharge sample.
- Three hazardous mine openings (two open shafts and one caved shaft) were observed at the site, two of the openings were surrounded by barbed wire; however, the barbed wire was very loose and did not include any warning signs.

**Broad Gauge PA# 29-293**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 07/16/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-293-WR-1	208	33.6	9.3 J	19.5	65	213	59400	0.344	1620	73	2660	4 UJ	1900	NR
29-293-WR-2	257	37.3	0.6 J	26.7	58.4	63.2	31900	0.409	1630	109	231	3 UJ	164	NR
BACKGROUND	16	89.4	0.8 JX	9.4	25.1	21.6	14900	1.1	366	19	36	4 UJ	80	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
29-293-WR-1	2.46	76.9	1.35	135	1.6	58.5	0.38	0.38	11.9	123	0.48	0.48	11.9	123
29-293-WR-2	1.53	47.8	1.69	169	1.1	122	0.21	0.21	6.56	163	0.22	0.22	6.56	163

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-293-SW-1	8.65	10.6	2.55 U	5.99 U	5 U	6.9 J	640	0.14	77.3	8.78 U	32.9	18.3 U	190	280

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-293-SW-1	360	< 5.0	106	0.31	NR

**LEGEND**

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A, 2B, and 2C.  
 BACKGROUND - From the Latest Out Mine (29-354-SS-1).  
 SW1 - Caved flowing adit.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Latest Out</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 4W</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 32</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 26' 35"</u>	Primary Drainage: <u>Ruby River</u>
Longitude: <u>W 112° 06' 53"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Sand Coulee</u>
Quad: <u>Copper Mountain</u>	Date Investigated: <u>June 17, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-354</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 13,871 cubic yards. The following elements were elevated at least three times background:

Arsenic: 68 mg/kg	Cadmium: 3.3JX to 7JX mg/kg
Cobalt: 31.3 mg/kg	Copper: 166 to 227 mg/kg
Iron: 46,300 mg/kg	Manganese: 1,190 to 1,760 mg/kg
Nickel: 83 mg/kg	Lead: 329 to 671 mg/kg
Zinc: 282 mg/kg	
- A groundwater spring, which flowed into a stock watering trough, was identified at the site. No MCLs were exceeded in the spring; however, the chronic aquatic life criteria for mercury was exceeded. The pH measurement in the spring was 7.42.
- An intermittent drainage was located north of the site. The drainage was dry during the investigation; no surface water or sediment samples were collected.
- Potential safety hazards identified at the site included three open shafts and four open adits.

Latest Out PA# 29-354  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-354-WR-1	32	177	3.3 JX	24.7	15	166	46300	0.015 U	1760	33	671	4 UJ	262	NR
29-354-WR-2	68	151	7 JX	31.3	49	227	37800	0.014 U	1190	83	329	4 J	214	NR
BACKGROUND	16	89.4	0.8 JX	9.4	25.1	21.6	14900	1.1	366	19	36	4 UJ	80	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR %	ACID BASE 1/1000	POTENT. 1/1000	NEUTRAL POTENT. 1/1000	ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000
29-354-WR-1	<0.01	0	20.7	20.7	<0.01	0.02	<0.01	0	20.7			
29-354-WR-1DUP	0.01	0.31	19.8	19.5	<0.01	0.02	<0.01	0	19.8			
29-354-WR-2	0.26	8.12	31.9	23.8	0.24	0.03	<0.01	0	31.9			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-354-GW-1	1.69 U	49.1	2.55 U	5.99 U	5 U	1.53 J	14.6	0.25	17.9	8.78 U	1.55 U	18.3 U	6 U	178

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-354-GW-1	279	< 5.0	33	0.68	NR

LEGEND

WR1 - Composite of subsamples WR3, 4, and 5.  
WR2 - Composite of subsamples WR1, 2, 6, 7, 8, and 9.  
WR2DUP - Duplicate of sample 29-354-WR-2.  
BACKGROUND - 300 feet upgradient of waste rock dump 8.  
From the Latest Out (29-354-SS-1).

GW1 - Spring below waste rock dump 2 in pipe.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Uncle Sam</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 3W</u>	Section(s): <u>NE 1/4, Sec. 17</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 45° 29' 35"</u>	Primary Drainage: <u>Mill Creek</u>
Longitude: <u>W 111° 59' 15"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Middle Fork Mill Creek</u>
Quad: <u>Ramshorn Mountain</u>	Date Investigated: <u>June 16, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-383</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 18,600 cubic yards. The following elements were elevated at least three times background:

Arsenic: 258 mg/kg	Cadmium: 4.9JX mg/kg
Copper: 261 mg/kg	Mercury: 0.473 mg/kg
Lead: 443 mg/kg	Zinc: 494 mg/kg
- Two discharging adits were identified at the site. MCLs for cadmium and nickel were exceeded in both discharges; additionally, the MCL for antimony was exceeded in the lower adit (SW-3). Acute and chronic aquatic life criteria were exceeded for cadmium, copper, and zinc in both discharges, and chronic aquatic life criteria were exceeded for iron, mercury, and lead in both discharges. Adit discharge pH measurements were 3.29 and 4.95 for SW-3 and SW-4, respectively.
- Middle Fork Mill Creek was flowing adjacent to the site on the south side. Surface water and sediment samples were collected upstream and downstream from the site in Middle Fork Mill Creek. No MCLs were exceeded; however, acute and chronic aquatic life criteria were exceeded for zinc in the downstream sample. The chronic aquatic life criteria for copper was exceeded in the downstream sample. An observed release to Middle Fork Mill Creek was documented for zinc. Additionally, observed releases to Middle Fork Mill Creek (sediment) were documented for lead and zinc.
- No hazardous mine openings were identified at the site; however, a case of explosives, saturated with water, was located at the site.

**Uncle Sam PA# 29-383**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 06/16/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-383-SE-1	23	97.7	1 UJX	21.9	71.8	42.3	23000	0.03 U	579	62	20	7 UJ	65	NR
29-383-SE-2	62	28.4	2.5 JX	17.2	42.4	86.9	28700	0.021	456	55	68	4 UJ	216	NR
29-383-WR-1	258	13.8	4.9 JX	28.2	10.8	261	50200	0.473	470	77	443	4 UJ	494	NR
29-383-WR-2	3 U	63.5	0.8 JX	16	62.4	54.6	18100	0.013 U	226	49	15	3 UJ	39	NR
BACKGROUND	20	96.4	1.2 JX	20.2	42.1	35.1	18200	0.017 U	608	59	25	4 UJ	61	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r
29-383-WR-1	1.82	56.9	40.5	-16	0.65	1.01	31.6	8.91
29-383-WR-2DUP	0.01	0.31	9.59	9.28	0.01	<0.01	0	9.59
29-383-WR-2	0.03	0.94	10.1	9.21	0.02	<0.01	0	10.1

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-383-SW-1	1.69 U	6.57	2.55 U	5.99 U	5 U	1.35 U	26.8	0.19	2.6 U	8.78 U	1.55 U	18.3 U	6 U	16.2
29-383-SW-2	1.69 U	7.17	2.55 U	5.99 U	5 U	3.23 J	277	0.2	19.9	8.78 U	1.55 U	18.3 U	37.3	18.2
29-383-SW-3	4.18	3.8	19.3	34.5	5 U	114 J	2550	0.18	869	104 J	16.9	19.2	1240	220
29-383-SW-5	7.34	7.7	22.8	41.9	6.97	69.9 J	5490	0.26	1290	212 J	18.8	18.3 U	2090	163

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-383-SW-1	56	< 5.0	6	0.09	NR
29-383-SW-2	58	< 5.0	8	0.06	NR
29-383-SW-3	306	< 5.0	163	0.15	NR
29-383-SW-5	284	< 5.0	181	< 0.05	NR

**LEGEND**

- SE1 - Upgradient on Middle Fork Mill Creek, 100' above upper edit dump 1.  
 SE2 - Downgradient of upper edit discharge into Mill Creek. (PPE for upper edit discharge).  
 WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 WR2 - Sample of the subsample WR2.  
 WR2DUP - Duplicate of sample 29-383-WR-2.  
 BACKGROUND - From the Uncle Sam Mine (29-383-S5-1).
- SW1 - Same as SE1.  
 SW2 - Same as SE2.  
 SW3 - Lower edit discharge in Middle Fork Mill Creek above confluence with Mill Creek.  
 SW5 - Upper edit discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Lakeshore  
Legal Description: T 3S R 4W  
Mining District: Sheridan  
Latitude: N 45° 35' 00"  
Longitude: W 112° 07' 00"  
Land Status: Private/Public  
Quad: Noble Peak  
Inspectors: Babits, Lasher/Pierson  
Organization: Pioneer Technical Services,  
Inc./Thomas, Dean and Hoskins, Inc.

County: Madison  
Section(s): SE 1/4, SE 1/4, Sec. 8  
Mine Type: Hardrock/Au  
Primary Drainage: Wisconsin Creek  
USGS Code: 10020003  
Secondary Drainage: Crystal Lake  
Date Investigated: July 21, 1993  
P.A. # 29-436

- There were approximately 13,300 cubic yards of uncovered tailings at the site. The following were elevated at least 3 times background:  
Copper: 587 mg/kg  
Mercury: 5.18J mg/kg  
Lead: 1,330 mg/kg  
Zinc: 511 mg/kg
- There were approximately 38,300 cubic yards of uncovered waste rock. The following were elevated at least 3 times background:  
Cadmium: 47.6 mg/kg  
Copper: 379 mg/kg  
Lead: 768 to 3,500 mg/kg  
Zinc: 302 to 8,720 mg/kg
- There were two discharging adits at the site (SW-3 and SW-4) and one (SW-3) entered Crystal Lake. Measured pH's were 7.97 (SW-3) and 7.92 (SW-4). Neither discharge exceeded MCLs or MCLGs or any chronic or acute fresh water aquatic life criteria.
- Crystal Lake contained tailings and was adjacent to waste rock and Wisconsin Creek was adjacent to waste rock. Observed releases of cadmium, copper, mercury, lead, and zinc were documented in downstream sediments; and an observed release of copper was documented in downstream surface water. No MCLs or MCLGs were exceeded, but chronic and acute fresh water aquatic life criteria were exceeded for copper in downstream surface water.
- There were three open adits at the site.

Lakeshore PA# 29-436  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/21/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-436-SE-1	11.9	37.5	1.2	9.41	23.7	20.3	12300	0.064 J	271 J	17.6	14.6	6.66 U	41	NR
29-436-SE-2	102	223	9.7	31	54.9	191	32500	0.825 J	3910 J	42	322	18.9 U	686	0.783 U
29-436-TP-1	186	28.8	1.4	4.8	8.36	587	38200	5.18 J	121 J	9.06	1330	16.4	511	0.326 U
29-436-WR-1	15.1	89.3	0.6	17.2	38.8	87	28600	0.701 J	601 J	40.6	47.8	4.63 U	108	NR
29-436-WR-2	307	24.6	47.6	5.36	7.94	379	62300	0.27 J	72.2 J	7.62	3500	25.6	8720	NR
29-436-WR-3	41.3	45.9	1.3	12.9	26	101	23100	0.127 J	423 J	19.8	768	6.22 U	302	NR
BACKGROUND	103	94	1.8	19.8	100	57.4	34300	1.23 J	606 J	61.4	31.9	16.9	70.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		ACID BASE	
	TOTAL	ACID BASE	SULFUR	ACID BASE	POTENT.	POTENT.	SULFUR	ACID BASE	SULFUR	SULFUR	SULFUR	SULFUR	SULFUR	SULFUR	ACID BASE	ACID BASE	POTENT.	POTENT.	POTENT.	
	%	v/1000	v/1000	v/1000	v/1000	v/1000	v/1000	v/1000	%	%	%	%	%	%	v/1000	v/1000	v/1000	v/1000	v/1000	
29-436-WR-1	0.64	20			36.9		16.9		0.05		0.3		0.29		9.37		37.6			
29-436-WR-2	1.87	58.4			-1.6		-80		1.58		0.08		0.21		2.5		-4.07			
29-436-WR-3	0.04	1.25			3.12		1.87		0.02		<0.01		0.02		0		3.12			
29-436-WR-3DUP	0.04	1.25			3.28		2.03		0.02		<0.01		0.02		0		3.28			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-436-SW-1	1.69 U	8.63	2.57 U	9.7 U	6.83 U	1.55 U	14.8	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	25.5
29-436-SW-2	1.38	11.5 JX	2.57 U	9.7 U	10.5 J	9.23 J	72.9 J	0.038 U	4.08 U	12.9	0.72 U	30.7 U	10.4 J	32.8
29-436-SW-3	2.29	18.4 JX	2.57 U	9.7 U	7.07 J	6 J	72.8 J	0.038 U	4.13	12.7 U	0.72 U	30.7 U	29.2 J	96.6
29-436-SW-4	1.32	2.01 UX	2.57 U	9.7 U	6.83 U	1.55 U	17 J	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	0.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-436-SW-1	93	< 5.0	9	0.08	< 0.01
29-436-SW-2	72	< 5.0	11	< 0.05	< 0.01
29-436-SW-3	150	< 5.0	38	0.1	NR
29-436-SW-4	NR	NR	NR	NR	< 0.01

LEGEND

- SE1 - 20 feet upstream from waste rock dump 2.  
SE2 - 20 feet downstream from culvert at South end of Crystal Lake.  
TP1 - Composite of subsamples TP1A, 1B, and 1C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 1E, and 3.  
WR2 - Sample of the subsample WR1F.  
WR3 - Sample of the subsample WR2.  
WR3DUP - Duplicate of the sample 29-436-WR-3.  
BACKGROUND - Above waste rock dump 3.
- SW1 - Same as SE1.  
SW2 - Same as SE2.  
SW3 - Southern side discharge at waste rock dump 1.  
SW4 - Northern side discharge at waste rock dump 1.

From the Lakeshore Mines (29-436-SR-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Buckeye</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 4W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 19</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Pb, Zn, Au, Ag, Cu</u>
Latitude: <u>N 45° 28' 15"</u>	Primary Drainage: <u>Ruby River</u>
Longitude: <u>W 12° 07' 47"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Mill Creek</u>
Quad: <u>Sheridan</u>	Date Investigated: <u>August 27, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>29-451</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were approximately 6,900 cubic yards of tailings associated with this site. The following elements were elevated at least three times background:

Arsenic: 58.1J to 90.3J mg/kg	Cadmium: 5.8J to 7.91J mg/kg
Copper: 135 to 205 mg/kg	Lead: 677 to 714 mg/kg
Zinc: 671 to 823 mg/kg	
- There were approximately 4,350 cubic yards of mostly uncovered waste rock at the site. The following were elevated at least three times background:

Arsenic: 129J to 359J mg/kg	Manganese: 3,050 mg/kg
Cadmium: 17.2J to 24.9J mg/kg	Nickel: 127 mg/kg
Cobalt: 47.4 mg/kg	Lead: 427 to 10,300 mg/kg
Copper: 159 to 1,460 mg/kg	Antimony: 12.4 mg/kg
Iron: 45,100 to 58,700 mg/kg	Zinc: 3,060 to 4,130 mg/kg
- There were no discharging adits at the site.
- Mill Creek was adjacent to waste rock and observed releases of copper, lead and zinc were documented in downstream sediments. No surface water samples were collected because of high flow in Mill Creek.
- Barrels with unknown contents were at the site. There were no hazardous openings; however, there were numerous hazardous structures.

**Buckeye PA# 29-451**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/27/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-451-SE-1	4.27 U	31.1	0.82 U	4.57	21.5	12.5	8020	0.09 J	158	16.9	6.39	5.64 U	22.2	<0.309
29-451-SE-2	8.47 J	71	1.11 U	12.1	62	40.9	15300	0.174 J	192	40.2	55.5	7.68 U	131	<0.387
29-451-TP-1	90.3 J	101	5.65 J	12.8	24.6	205	25200	0.517 J	978	35.5	677	6.62 U	674	<0.280
29-451-TP-2	58.1 J	121	7.91 J	15.1	18.8	135	25700	1.1 J	1060	28	714	6.87 U	823	<0.283
29-451-WR-1	359 J	98.4	24.90 J	47.4	41.4	159	58700	0.907 J	3050	127	427	6.8 U	4130	NR
29-451-WR-2	129 J	21.4	17.20 J	6.1	3.92	1460	45100	2.64 J	336	7.06	10300	12.4	3060	NR
BACKGROUND	16	89.4	0.8 JX	9.4	25.1	21.6	14900	1.1	366	19	36	4 UJ	80	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000	NEUTRAL POTENT 1/1000	SULFUR ACID BASE POTENT 1/1000	SULFUR SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT 1/1000
29-451-TP-1	0.73	22.8	113	90.6	0.32	0.28	0.13	8.75	105
29-451-TP-2	0.8	25	124	99	0.19	0.54	0.07	16.9	107
29-451-WR-1DUP	1.75	54.7	117	62.6	0.31	0.86	0.58	26.9	90.4
29-451-WR-1	1.72	53.7	119	65.6	0.28	0.86	0.58	26.9	92.5
29-451-WR-2	6.22	194	15.3	-179	2.66	1.48	2.08	46.2	-30.9

**LEGEND**

SE1 - 500 feet upgradient of waste rock dump 5 in Mill Creek.  
 SE2 - Downgradient (@ PPE) of waste rock dump 5 in Mill Creek.  
 TP1 - Composite of subsamples TPA-A,1A-B,2A-A,2A-B,3A-A  
 TP2 - Composite of subsamples TPA-A-C through 1A-F, TP2A-C, and TP2A-B through 3A-E.  
 WR1 - Composite of subsamples WR1, 2, and 3.  
 WR1DUP - Duplicate of sample 29-451-WR-1.  
 WR2 - Composite of subsamples WR4A, 4B, 5A, and 5B.  
 BACKGROUND - From Latent Out (29-354-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>SE SW S26</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 5W</u>	Section(s): <u>SE 1/4, SW 1/4, Sec. 26; NW 1/4, NW 1/4, Sec. 35</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 32' 30"</u>	Primary Drainage: <u>Ruby River</u>
Longitude: <u>W 112° 11' 20"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Wet Georgia Gulch</u>
Quad: <u>Old Baldy Mountain</u>	Date: <u>June 17, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>29-474</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- There were over 17 waste rock dumps located at the site with the total volume of waste rock estimated to be approximately 14,580 cubic yards. The following elements were elevated at least three times background:

Arsenic: 726 to 4650 mg/kg	Cadmium: 52.4J to 57J mg/kg
Copper: 133 to 650 mg/kg	Mercury: 0.544 to 2.92 mg/kg
Nickel: 136 to 142 mg/kg	Lead: 4360 to 14,400 mg/kg
Antimony: 12J mg/kg	Zinc: 2300 to 8210 mg/kg
- There were no adit discharges, filled shafts, seeps, or springs observed at the site during the investigation; consequently, no groundwater or surface water samples were collected.
- Adits #3, #4B, and #5 were open and potentially hazardous.

SE SW Section 26 PA# 29-474  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-474-WR-1	726	156	15.8 J	19.8	63.7	205	24000	2.23	2590	136	14400	7 J	2300	NR
29-474-WR-2	1930	220	0.5 U	37.1	67	133	42600	2.92	1110	142	185	9 J	164	NR
29-474-WR-3	2450	249	57 J	21.8	58.6	650	47100	0.587	3550	83	4360	13 J	8210	NR
29-474-WR-4	4650	168	52.4 J	18.2	20.2	509	57400	0.544	2670	41	5670	10 J	7660	NR
BACKGROUND	26	154	8.6 JX	15.3	26.1	29.6	20200	0.021	1240	43	89	4 UJ	70	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE %1000x	NEUTRAL POTENT. %1000x	SULFUR ACID BASE POTENT. %1000x	SULFATE SULFUR %1000x	PYRITIC SULFUR %1000x	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE %1000x	SULFUR ACID BASE POTENT. %1000x
29-474-WR-1	0.03	0.94	75.5	74.6	0.01	<0.01	0.02	0	75.5
29-474-WR-2	<0.01	0	61.6	61.6	<0.01	<0.01	0.01	0	61.6
29-474-WR-3	0.14	4.37	36.3	31.9	0.12	<0.01	0.03	0	36.3
29-474-WR-4	0.51	15.9	24.8	8.9	0.46	0.02	0.03	0.62	24.2

LEGEND

WR1 - Composite of subsamples WR1 through 6E.  
WR2 - Composite of subsamples WR7 through 9.  
WR3 - Composite of subsamples WR10, 11, and 13.  
WR4 - Composite of subsamples WR14 through 17.  
BACKGROUND - From NW SE Sec. 26 (29-476-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>NW SE S26</u>	County: <u>Madison</u>
Legal Description: T <u>3S</u> R <u>5W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 26</u>
Mining District: <u>Sheridan</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 32' 50"</u>	Primary Drainage: <u>Ruby River</u>
Longitude: <u>W 112° 10' 42"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Wet Georgia Gulch</u>
Quad: <u>Old Baldy Mountain</u>	Date Investigated: <u>June 17, 1993</u>
Inspectors: <u>Babits, Tuesday, Belanger, Clark, Lasher/Pierson</u>	P.A. # <u>29-476</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- There was approximately 5,900 cubic yards of mostly uncovered waste rock at the site. The following were elevated at least 3 times background:
  - Arsenic: 169 to 832 mg/kg
  - Chromium: 238 mg/kg
  - Copper: 98.1 to 187 mg/kg
  - Mercury: 0.091 to 0.477 mg/kg
  - Nickel: 231 mg/kg
  - Lead: 504 to 3,790 mg/kg
  - Zinc: 2,240 to 2,250 mg/kg
- There were no discharging adits at the site.
- There was waste rock material in the drainage of intermittent Wet Georgia Gulch. There were no surface water samples collected and there were no observed releases documented.
- There were two open adits at the site.

NW SE Section 26 PA# 29-476  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-476-SE-3	14	83.9	0.6 UJX	10.4	65.1	15.5	16000	0.02 U	140	55	31	4 UJ	84	NR
29-476-SE-4	20	145	1 JX	15.1	83.5	22.1	25700	0.017 U	473	62	66	4 UJ	112	NR
29-476-WR-1	169	262	16 JX	19.5	52.8	48.7	35400	0.334	2260	79	504	4 UJ	2240	NR
29-476-WR-2	832	417	19.6 JX	30.2	238	187	44000	0.091	3670	231	3790	4 UJ	2250	NR
29-476-WR-3	27	139	1.5 JX	33	21.4	98.1	21000	0.477	855	43	2930	3 UJ	201	NR
BACKGROUND	26	154	8.6 JX	15.3	26.1	29.6	20200	0.021	1240	43	89	4 UJ	70	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			ORGANIC SULFUR			PYRITIC SULFUR			SULFUR		
	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%	ACID BASE	POTENT.	%
29-476-WR-1	0.25	7.81	96.4	88.6	0.01	0.07	0.17	2.19	94.2	0.28	4.37	0	0.15	3.97	6.57	1.55 U	18.3 U	6 U
29-476-WR-2	0.53	16.6	73	56.4	0.11	0.14	0.28	4.37	68.6	0.02	0.02	<0.01	0.15	3.97	6.57	1.55 U	18.3 U	6 U
29-476-WR-3	0.03	0.94	27.6	26.7	0.02	<0.01	0.02	0	27.6									

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-476-SW-3	1.69 U	75.7	2.55 U	5.99 U	5 U	3.43 J	94.8	0.15	3.97	12.7 J	1.55 U	18.3 U	6 U	191
29-476-SW-4	1.95	75.2	6.07	5.99 U	5 U	1.35 U	309	0.15	6.57	8.78 U	1.55 U	18.3 U	6 U	182

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-476-SW-3	222	< 5.0	9	0.23	NR
29-476-SW-4	207	< 5.0	9	0.25	NR

LEGEND

SE3 - Wet Georgia Gulch at confluence from Argentina.  
SE4 - Downstream from ores and workings.  
WR1 - Composite of subsamples WR1, 2, and 3.  
WR2 - Composite of subsamples WR4 and 5.  
WR3 - Composite of subsamples WR6, 7, and 8.  
BACKGROUND - From NW SE 26 (29-476-SS-1).

SW3 - Same as SE3.  
SW4 - Same as SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Broadway/Victoria</u>	County: <u>Madison</u>
Legal Description: <u>T 2S R 6W</u>	Section(s): <u>NW 1/4, Sec. 2</u>
Mining District: <u>Silver Star</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Cu</u>
Latitude: <u>N 45° 41' 55"</u>	Primary Drainage: <u>Jefferson River</u>
Longitude: <u>W 112° 18' 45"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Tom Benton Gulch</u>
Quad: <u>Silver Star</u>	Date Investigated: <u>September 17, 1993</u>
Inspectors: <u>M. Babits, S. Babits, Flammang</u>	P.A. # <u>29-179</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 132,000 cubic yards. The concentration of cyanide measured in the tailings ranged from 1.9 to 6.15 mg/kg. The following elements were elevated at least three times background:

Arsenic: 223J to 387J mg/kg	Cadmium: 17J to 78J mg/kg
Cobalt: 21.1 mg/kg	Copper: 547 to 4,010 mg/kg
Iron: 60,200JX to 89,000JX mg/kg	Mercury: 0.264J to 2.39J mg/kg
Manganese: 3,240 to 9,620 mg/kg	Lead: 1,380 to 3,760 mg/kg
Antimony: 51.7J mg/kg	Zinc: 3,550J to 32,300 mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 34,575 cubic yards. The following elements were elevated at least three times background:

Arsenic: 218J mg/kg	Cadmium: 48 mg/kg
Cobalt: 26.5 mg/kg	Copper: 716 to 3,290 mg/kg
Mercury: 0.694J to 1.56J mg/kg	Manganese: 4,690 mg/kg
Lead: 4,020 mg/kg	Zinc: 7,450 mg/kg
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
  
- No surface water was observed on or near the site. The nearest water was located approximately 1.5 miles away; consequently, no surface water or sediment samples were collected.
  
- Potential safety hazards identified at the site included four open adits and one open shaft.

**Broadway/Victoria PA# 29-179**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 09/17/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-179-TP-1	74.1 J	234 J	17 J	7.16	10.9 J	547	38100 JX	0.147 J	9620	21.5	1740	11.9 J	5230 J	NR
29-179-TP-2	61.4 J	23.3 J	11 J	10.4	9.34 J	4010	89000 JX	0.306 J	2290	12.7	622	7 UJ	1680 J	NR
29-179-TP-3	223 J	0.237 U	22 J	3.54	5.99 J	300	60200 JX	0.264 J	8040	16.1	1380	7.15 J	3550 J	NR
29-179-TP-4	68.2 J	98.5	78	21.1	28.7	2540	50400	2.39 J	3240	34.9	1870	51.7 J	32300	1.9
29-179-TP-5	387 J	28.1 J	37 J	6.93	12 J	599	60800 JX	0.58 J	4830	25.1	3760	18 J	7230 J	6.15
29-179-WR-1	218 J	62.1	48	9.45	16.9	716	29900	0.694 J	2280	17.2	4020	16.6 J	7450	NR
29-179-WR-2	8.82 J	47.4 J	3 J	26.5	4.88 J	3290	42500 JX	1.56 J	4690	11	18.5	5.97 UJ	330 J	NR
BACKGROUND	48.3 J	93.9	5	6.35	17.7	109	19100	0.087 J	1040	15.1	227	6.39 J	676	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE %	SULFUR ACID BASE POTENT. v/1000x
29-179-TP-1	0.06	1.87	2.17	215	0.05	<0.01	0	217
29-179-TP-2	6.08	190	23.5	-166	2.28	3.91	122	-98.6
29-179-TP-3	7.16	224	237	13	2.2	5.71	178	58.3
29-179-TP-4	2.01	223	237	13.5	2.21	5.68	177	59.2
29-179-TP-5	5.19	162	111	47.8	0.74	0.43	13.4	97.2
29-179-WR-1	0.99	30.9	190	27.5	1.73	6.42	201	-10.8
29-179-WR-2	0.06	1.87	189	158	0.32	<0.01	0	189
			135	133	0.01	<0.01	0	135

**LEGEND**

TP1 - Composite of subsamples TP1A-A, 1A-B, 1A-C, 1B-A, and 1B-B.  
TP2 - Composite of subsamples TP2A-A through 3A-D, and 3B-A.  
TP3 - Composite of subsamples TP2A-A and 2B-A.  
TP4 - Grab from flotation tanks in mill building.  
TP5 - Composite of subsamples TP2A-B, 2A-C, 2B-B, 2B-C, and 2B-D.  
WR1 - Composite of subsamples WR1, 2A, 2B, and 2C.  
WR2 - Sample of the WR6 subsample.  
BACKGROUND - From the Broadway/Victoria (29-179-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Mammoth</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>3W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 18</u>
Mining District: <u>South Boulder</u>	Mine Type: <u>Hardrock/Au, Ag, Cu</u>
Latitude: <u>N 45° 40' 00"</u>	Primary Drainage: <u>Missouri River</u>
Longitude: <u>W 112° 00' 40"</u>	USGS Code: <u>10020006</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Boulder River</u>
Quad: <u>Manhead Mountain</u>	Date Investigated: <u>July 19, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-008</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 47,950 cubic yards. The following elements were elevated at least three times background:

Arsenic: 676 to 704 mg/kg	Cadmium: 4.9J mg/kg
Cobalt: 26.2 mg/kg	Copper: 220 to 1,860 mg/kg
Mercury: 0.851 mg/kg	Lead: 90 mg/kg
Zinc: 293 mg/kg	
- The volume of waste rock associate with this site was estimated to be approximately 29,350 cubic yards. The following elements were elevated at least three times background:

Arsenic: 223 to 339 mg/kg	Copper: 225 to 401 mg/kg
Mercury: 1.09 mg/kg	Lead: 87 mg/kg
- One discharging adit was identified at the site. The discharge seeped into waste rock prior to reaching surface water. A sample of this discharge had a pH of 7.45. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria were exceeded for copper. The pH measurement in the adit discharge was 7.45.
- An unnamed tributary flowed through the site and discharged into the South Boulder River. Observed releases to the South Boulder River (sediment) were documented for arsenic and copper
- Potential safety hazards identified at the site included one open shaft and two open adits.

**Mammoth Mine PA# 29-008**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/19/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-008-SE-1	5 U	67.2	1.4 J	5.5	12.1	15	9800	0.259	274	12	12	6 U	28	NR
29-008-SE-2	7 U	31.3	1.8 J	12.4	28	64.4	10300	0.287	377	33	16	8 U	107	NR
29-008-SE-3	103 J	131 J	1.7	19.6 JX	39.2 JX	285 J	27200 J	0.594	723 J	39 J	33	8 UJ	214 JX	NR
29-008-TP-1	676	249	2.2 J	2 U	1.9	220	26900	0.372	20.6	3 U	54	6 U	50	NR
29-008-TP-2	704	279	4.9 J	26.2	8	1860	44200	0.851	398	24	90	8 U	293	NR
29-008-WR-1	223	88.3	3.5 J	12.6	16.7	401	36300	1.09	358	20	60	5 U	75	NR
29-008-WR-2	339	143	2.4 J	7	9.6	225	30800	0.474	140	13	87	6 U	66	NR
BACKGROUND	28	174	1.5 J	11	24.3	28.6	15900	0.219	1000	18	23	6 U	47	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
29-008-TP-1	0.15	4.69	-0.7	-5.4	0.13	0.02	<0.01	0.62	-1.31
29-008-TP-2	1.64	51.2	6.66	-45	0.07	1.36	0.21	42.5	-35.8
29-008-WR-1	0.41	12.8	12.1	-0.7	0.25	0.05	0.11	1.56	10.5
29-008-WR-2	0.71	22.2	1.31	-21	0.51	0.06	0.14	1.87	-0.57

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
29-008-SW-1	1.69 U	37.9	2.57 U	9.7 U	6.83 U	1.55 U	34.8	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	44
29-008-SW-1	26.5	18.8	4.77 J	9.7 U	6.83 U	305	2740	0.039	333	16.4	1.85	30.7 U	129	83.1
29-008-SW-3	6.07	33.4	2.57 U	9.7 U	6.83 U	173	420	0.038 U	28.7	12.7 U	1.55 U	30.7 U	24.9	48.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-008-SW-1	127	< 5.0	5	0.08	NR
29-008-SW-1	153	< 5.3	75	0.11	NR
29-008-SW-3	141	< 5.0	15	0.14	NR

**LEGEND**

- SE1 - Upgradient in unnamed tributary.  
SE2 - In Boulder Creek above confluence of unnamed tributary with adit discharge.  
29-008-SE3 - Downgradient of site on South Boulder River.  
TP1 - Composite of subsamples TP1A-B, 1A-C, 1A-D, and 1A-E.  
TP2 - Composite of subsamples TP1A-B, 1A-C, 1A-D, and 1A-E.  
WR1 - Composite of subsamples WR1, 2A, 2B, 3A, 3B, and 3C.  
WR2 - Composite of subsamples WR4A, 5A, 5B, and 6.  
BACKGROUND - From Mammoth Mine (29-008-SS-1).
- SW1 - Same as sample SE1.  
29-008-SW1 - At PPE of adit discharge and unnamed tributary to S. Boulder River.  
SW3 - Adit discharge at Level 1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Mammoth Tailings</u>	County: <u>Madison</u>
Legal Description: T <u>2S</u> R <u>3W</u>	Section(s): <u>Sec. 7 and Sec. 18</u>
Mining District: <u>South Boulder</u>	Mine Type: <u>Hardrock/Au, Ag, Cu</u>
Latitude: <u>N 45° 40' 14"</u>	Primary Drainage: <u>Jefferson River</u>
Longitude: <u>W 112° 00' 48"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>South Boulder River</u>
Quad: <u>Manhead Mountain</u>	Date Investigated: <u>July 19, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>29-082</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 405,500 cubic yards. Evidence of tailings eroding along the bank of the South Boulder River was observed at the time of the investigation. The following elements were elevated at least three times background:  
Arsenic: 289J to 651J mg/kg                      Copper: 434J to 1160J mg/kg  
Lead: 105 mg/kg                                      Zinc: 224JX mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 1000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 244J mg/kg                                      Mercury: 1.2 mg/kg
- There was one adit discharge observed at the site during the investigation. No MCLs/MCLGs were exceeded in the adit discharge sample; however, the acute aquatic life criteria for copper and zinc were exceeded, as well as the chronic aquatic life criteria for copper and zinc. No MCLs/MCLGs were exceeded in a surface water sample collected in the unnamed tributary to the South Boulder River; however, chronic aquatic life criteria for iron, copper and zinc were exceeded, and acute aquatic life criteria for cadmium, copper and zinc were exceeded. No MCLs/MCLGs were exceeded in a groundwater sample collected from a monitoring well located in the northwest section of the site; however, the chronic aquatic life criteria for iron and cadmium were exceeded in the sample.
- Observed releases to the South Boulder River (sediment) were documented for arsenic and copper which were attributable to the site.
- Potential safety hazards observed during the investigation included an open adit and an unstable highwall where tailings were excavated for reprocessing. The chemical building located at the south end of the site contained barrels of sodium sulfide, sodium hypochlorite, caustic soda, sodium cyanide residue, and bags of lime.

Mammoth Tailings PA# 29-082  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/19/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-082-SE-1	898 J	114 J	2.2	101 JX	24.8 JX	1010 J	55800 J	0.388	2930 J	49 J	35	7 UJ	275 JX	NR
29-082-SE-2	7 U	31.3	1.8 J	12.4	28	64.4	10300	0.287	377	33	16	8 U	107	NR
29-082-SE-3	103 J	131 J	1.7	19.6 JX	39.2 JX	285 J	27200 J	0.594	723 J	39 J	33	8 UJ	214 JX	NR
29-082-TP-1	289 J	224 J	0.7	9.8 JX	7.4 JX	434 J	38300 J	0.368	530 J	11 J	22	7 UJ	94 JX	0.279 U
29-082-TP-2	651 J	263 J	1.9	32.2 JX	5.2 JX	1180 J	43200 J	0.398	441 J	26 J	23	6 UJ	224 JX	0.308 U
29-082-TP-3	515 J	143 J	1.1	6.6 JX	4.2 JX	648 J	28000 J	0.276	173 J	9 J	105	7 UJ	106 JX	0.292 U
29-082-WR-1	244 J	137 J	0.9	5.6 JX	3.9 JX	63.7 J	23000 J	1.2	223 J	9 J	19	5 UJ	74 JX	NR
BACKGROUND	28	174	1.5 J	11	24.3	28.6	15900	0.219	1000	18	23	6 U	47 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	TOTAL SULFUR %	ACID BASE v/1000r	ACID BASE POTENT. v/1000r	NEUTRAL POTENT. v/1000r	ACID BASE POTENT. v/1000r	SULFATE %	PYRITIC %	SULFUR %	SULFATE %	PYRITIC %	ACID BASE v/1000r	ACID BASE POTENT. v/1000r	SULFUR %	ACID BASE v/1000r	ACID BASE POTENT. v/1000r	SULFUR	ACID BASE POTENT. v/1000r	
29-082-TP-1	1.91	59.7	-5	16	3.52	0.91	0.85	0.15	0.91	0.85	26.6	-31.5	0.05	0.05	6.25	9.77		
29-082-TP-2	0.4	12.5	22.7	20.2	1.97	<0.01	0.16	0.06	<0.01	0.16	5	17.7	0.05	0.05	1.25	10.4		
29-082-TP-3	0.08	2.5	11.7			0.22	0.04	0.05	0.22	0.04								
29-082-WR-1	0.31	9.68																

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-082-GW-1	24.5	19	2.83 J	9.9	6.83 U	306	2710	0.038 U	347	19.3	2.27	30.7 U	136	86.3
29-082-GW-2	1.79	31.5	2.57 U	9.7 U	6.83 U	1.55 U	1640	0.038 U	205	13.3	1.83	30.7 U	17.9	127
29-082-SW-1	26.5	18.8	4.77 J	9.7 U	6.83 U	305	2740	0.039	333	16.4	1.85	30.7 U	129	83.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED	SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-082-GW-1	140	6.3	74	0.17	NR	NR
29-082-GW-2	196	5.8	95	< 0.05	< 0.01	NR
29-082-SW-1	153	5.3	75	0.11	NR	NR

LEGEND

- SE1 - At PPE of edit discharge and S. Boulder River, in the tributary.
- SE2 - Upgradient sediment sample in the S. Boulder River.
- SE3 - Downgradient of site on S. Boulder River.
- TP1 - Composite of subsamples TP1A-1 through 1A-3, 1B-1 through 1B-3, 1C-1 through 1C-3.
- TP3 - Composite of subsamples TP2A-1 through 2A-3, 2B-1, and 2B-2.
- WR1 - Sample of the WR1A subsample.
- BACKGROUND - From the Mammoth Mine (29-008-S8-1).
- GW1 - Flowing edit.
- GW2 - Monitor well, Northwest corner.
- SW1 - Same as sample SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>B &amp; H</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 4W</u>	Section(s): <u>NE 1/4, NE 1/4, Sec. 7</u>
Mining District: <u>Tidal Wave</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Cu</u>
Latitude: <u>N 45° 35' 40"</u>	Primary Drainage: <u>Currant Creek</u>
Longitude: <u>W 112° 07' 45"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Bear Gulch</u>
Quad: <u>Old Baldy Mountain</u>	Date Investigated: <u>July 23, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-083</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 42,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 113 mg/kg	Cadmium: 3.8 to 4.2 mg/kg
Cobalt: 42.4J mg/kg	Chromium: 108 to 158 mg/kg
Copper: 215J to 2,930J mg/kg	Iron: 80,100 mg/kg
Mercury: 1.47J mg/kg	Nickel: 196J mg/kg
Lead: 68J to 81J mg/kg	Zinc: 422J mg/kg
- Two discharging adits were identified at the site during the investigation. One of the discharges eventually entered Bear Gulch; this discharge was sampled for laboratory analysis. No MCLs or acute or chronic aquatic life criteria were exceeded in the adit discharge.
- Bear Gulch was flowing adjacent to the site on the north side during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Bear Gulch. No MCLs or acute or chronic aquatic life criteria were exceeded in Bear Gulch, and no observed releases were documented.
- No hazardous mine openings were identified at the site.

**B&H PA# 29-083**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/23/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-083-SE-1	35	142 J	5.6	18.4 J	116	261 J	31800	0.461 J	927	70 J	679 J	18 U	403 J	NR
29-083-SE-2	80	143 J	4.1	16.5 J	52.9	232 J	35900	0.108 J	3390	58 J	132 J	7 U	436 J	NR
29-083-WR-1	51	289 J	4.2	17.3 J	108	215 J	28200	1.47 J	764	52 J	81 J	5 U	422 J	NR
29-083-WR-2	113	154 J	3.8	42.4 J	158	2930 J	80100	0.093 J	2040	196 J	68 J	6 U	121 J	NR
BACKGROUND	103	94	1.8	19.8	100	57.4	34300	1.23 J	606 J	61.4	31.9	16.9	70.6 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
29-083-WR-1	0.47	14.7	9.52	61.7	-5.2	0.17	0.12	0.18	3.75	5.77	43.1	18.6		
29-083-WR-2	2.6	81.2	61.7	-20	-20	<0.01	1.38	1.33						

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-083-SW-1	2.4	24.2 JX	4.2 J	9.7 U	8.87 J	2.63 J	48.6 J	0.038 U	4.08 U	12.7 U	0.95 J	30.7 U	7.57 U	55.4
29-083-SW-2	1.18 U	20.8 JX	2.57 U	9.7 U	7.57 J	2.37 J	117 J	0.038 U	28.1	12.7 U	0.72 U	30.7 U	10 J	95.8
29-083-SW-3	3.76	13.3 JX	2.57 U	9.7 U	9 J	2.63 J	308 J	0.038 U	103	12.7 U	0.72 U	30.7 U	13.6 J	192

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-083-SW-1	97	< 5.0	34	< 0.05	NR
29-083-SW-2	154	< 5.0	50	< 0.05	NR
29-083-SW-3	274	< 5.0	81	< 0.05	NR

**LEGEND**

SE1 - 200' upgradient from discharging edit in unnamed tributary.  
 SE2 - 60' downgradient of waste rock dump 1 in unnamed tributary.  
 WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A, 2B, 3A, and 3B.  
 BACKGROUND - From Lakeshore (29-436-SS-1).  
 SW1 - Same as SE1.  
 SW2 - Same as SE2.  
 SW3 - Discharging edit at lower site.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Dry Gulch (South)</u>	County: <u>Madison</u>
Legal Description: <u>T 3S R 5W</u>	Section(s): <u>W 1/2, Sec. 15; E 1/2, Sec. 16</u>
Mining District: <u>Tidal Wave</u>	Mine Type: <u>Hardrock/Au, Ag, Pb</u>
Latitude: <u>N 45° 34' 40"</u>	Primary Drainage: <u>Jefferson River</u>
Longitude: <u>W 112° 12' 50"</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Dry Gulch/Spring Creek</u>
Quad: <u>Old Baldy Mountain</u>	Date Investigated: <u>July 20, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>29-282</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 16,930 cubic yards. The waste rock was separated into 23 dumps. The following elements were elevated at least three times background:

Arsenic: 93 to 145 mg/kg	Cadmium: 5.4 mg/kg
Chromium: 71.6JX mg/kg	Mercury: 1.01 mg/kg
Nickel: 65J to 104J mg/kg	Lead: 469 to 942 mg/kg
Zinc: 652JX mg/kg	
- There were no adit discharges, filled shafts, seeps or springs associated with this site.
- The Dry Gulch stream bed extended through the site from east to west. Sediment samples were collected upstream and downstream from the site in Dry Gulch. No observed releases were documented. None of the contaminant concentrations measured in the sediment samples were elevated significantly above background levels.
- One on site adit and one on site shaft represented hazardous openings. Several of the dumps appeared to have been reclaimed and several mine openings had been closed by Department of State Lands.

**Dry Gulch South PA# 28-282**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 07/20/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-282-SE-1	31 J	170 J	0.6 U	6.5 JX	14.5 JX	30.1 J	14200 J	0.309	592 J	21 J	38	7 UJ	76 JX	NR
29-282-SE-2	7 J	45.5 J	0.5 U	11.5 JX	37.4 JX	36.6 J	14400 J	0.13	331 J	50 J	7 U	5 UJ	40 JX	NR
29-282-WR-1	93 J	94.7 J	1.3	20.4 JX	71.6 JX	92.6 J	32600 J	0.453	614 J	104 J	469	6 UJ	190 JX	NR
29-282-WR-2	145 J	105 J	5.4	18.5 JX	57.8 JX	80.5 J	27400 J	1.01	1130 J	65 J	942	5 UJ	652 JX	NR
BACKGROUND	25 J	260 J	1.1	6.9 JX	19.9 JX	32.4 J	15900 J	0.246	935 J	18 J	16	8 UJ	105 JX	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
29-282-SS-1	0.03	0.94	136	135	<0.01	0.01	0.03	0.31	136
29-282-WR-1	0.06	1.87	119	118	0.06	<0.01	<0.01	0	119
29-282-WR-1DUP	0.06	1.87	122	120	0.05	0.01	<0.01	0.31	122
29-282-WR-2	0.03	0.94	78	77.1	0.03	<0.01	<0.01	0	78

**LEGEND**

SE1 - Upgradient in Dry Gulch.  
 SE2 - Downgradient in Dry Gulch.  
 WR1 - Composite of subsamples WRJF, KF, LF, GR, IF, FR, ER, HF, GF, EF, QE, and EE.  
 WR2 - Composite of subsamples WRJE, CF, DE, DF, BE, BF, AR, and I.  
 BACKGROUND - From Dry Gulch South (29-282-SS-1).  
 WR1DUP - Duplicate of sample 29-282-WR-1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>U.S. Grant</u>	County: <u>Madison</u>
Legal Description: <u>T 6S R 3W</u>	Section(s): <u>NW 1/4, SW 1/4, Section 26</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock, Millsite/Au, Ag</u>
Latitude: <u>N 46° 24' 58.8"</u>	Primary Drainage: <u>Granite Creek</u>
Longitude: <u>W 112° 18' 40.6"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Alder Gulch</u>
Quad: <u>Virginia City</u>	Date Investigated: <u>July 18, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>29-095</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be 20,930 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 22.6 to 28.9 mg/kg	Mercury: 0.27J mg/kg
Arsenic: 143 mg/kg	Lead: 468 to 13,700 mg/kg
Copper: 125 to 759 mg/kg	Antimony: 124J mg/kg
Iron: 108,000 mg/kg	Zinc: 338 to 13,100 mg/kg
- The volume of waste rock observed at the site was estimated to be 3,305 mg/kg. The following elements were elevated to at least three times the background concentrations:

Silver: 6.8 to 39.9 mg/kg	Mercury: 0.38J to 0.42J mg/kg
Arsenic: 31.6 mg/kg	Lead: 855 to 1,100 mg/kg
Cadmium: 4.9 mg/kg	Copper: 74.7 to 127 mg/kg
- One discharging adit was observed at the site. The flow from this adit eventually merged with Alder Gulch. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded.
- Two groundwater wells were sampled during the investigation. The MCL for antimony was exceeded in a monitoring well located at the base of the dam at TP-1. No MCLs were exceeded in a residential well located on-site.
- Alder Gulch flows through the center of the site. An observed release to Alder Gulch was documented for copper. No MCLs were exceeded in Alder Gulch; however, the acute and chronic aquatic life criteria for copper were exceeded in the downstream sample. These exceedances were directly attributable to the site.
- Potential safety hazards observed at the site included five open adits, a collapsing loadout structure, and a pit with a 40-foot tall highwall.

**U.S. Grant PA# 29-095**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - FLAMMANG**  
**INVESTIGATION DATE: 07/18/94**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-095-SE1	1.4 U	10.5 U	202	1.3 U	19.8	78.0	45.6	28000	0.35 J	520	60.8	53.6	16.2 UJ	114	NR
29-095-SE2	0.9 U	6.9 U	190	0.8 U	25.6	81.7	36.6	35100	0.31 J	609	90.7	36.7	10.6 UJ	97.9	NR
29-095-TP1	22.6	143	87.8	0.8 U	3.6	10.0	759	108000	0.16 J	680	4.5	13700	124 J	13100	1.715
29-095-TP2	28.9	10.0	123	1.6	6.6	16.9	125	17700	0.27 J	299	14.3	468	10.4 UJ	338	<0.276
29-095-WR1	6.8	31.6	181	1.8	13.2	30.4	74.7	23600	0.42 J	743	23.7	1100	9.2 UJ	224	NR
29-095-WR2	39.9	10.9	73.7	4.9	8.0	10.1	127	15900	0.38 J	421	7.6	855	9.5 UJ	265	NR
BACKGROUND	0.8 U	9.2	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	878	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	SULFUR	ACID BASE	SULFUR	ACID BASE	SULFATE	SULFUR	SULFUR	%	SULFUR	ACID BASE	SULFUR	ACID BASE	POTENT.	%
	%		%		%	%	%		%		%		%	
29-095-TP1	0.20	6.25	40.4	34.2	0.13	0.05	0.02	0.05	0.62	0.00	0.00	0.00	39.8	0.00
29-095-TP2	0.04	1.25	19.6	18.3	0.03	0.01	<0.01	0.01	0.00	0.00	0.00	0.00	19.6	0.00
29-095-WR1	0.01	0.31	19.4	19.0	0.01	<0.01	<0.01	<0.01	0.00	0.00	0.00	0.00	19.4	0.00
29-095-WR2	0.16	5.00	61.3	56.3	0.06	0.01	0.01	0.09	0.31	0.00	0.00	0.00	61.0	0.00

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-095-AD1	0.12 U	1.4	39.3	4.0 U	8.4 U	6.8 U	5.9 U	12.3 U	0.08	2.3 U	14.4 U	0.7	51.6 U	156 U	126
29-095-GW1	0.12 U	2.9	83.1	4.0 U	8.4 U	6.8 U	10.6 JX	26.5	0.16	4.6	14.4 U	1.1 U	55.8	15.6 U	177
29-095-GW2	0.12 U	4.3	83.4	4.0 U	8.4 U	6.8 U	7.2 JX	19.5	0.18	5.2	14.4 U	1.1 U	51.6 U	15.6 U	178
29-095-GW3	0.12 U	1.1	77.1	4.0 U	8.4 U	6.8 U	9.8	196	0.09	4.4	14.4 U	2.3	51.6 U	524	175
29-095-GW4	0.12 U	1.1 U	5.5 U	4.0 U	8.4 U	6.8 U	5.9 U	12.3 U	0.09	2.3 U	14.4 U	0.4 U	51.6 U	15.6 U	0.1
29-095-SW1	0.12 U	1.1 U	76.5	4.0 U	8.4 U	6.8 U	5.9 U	547	0.08	34.1	14.4 U	0.9	51.6 U	18.1	164
29-095-SW2	0.12 U	1.2	78.5	4.0 U	8.4 U	6.8 U	160	384	0.08 U	46.0	14.4 U	0.9	51.6 U	15.9	163

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-095-AD1	244	<5	18	1.1	NR
29-095-GW1	185	<5	11	0.06	<0.005
29-095-GW2	246	<5	10	0.06	<0.005
29-095-GW3	218	<5	14	0.07	<0.005
29-095-GW4	NR	NR	NR	NR	<0.005
29-095-SW1	195	<5	12	0.07	<0.005
29-095-SW2	159	<5	9	0.08	<0.005

**LEGEND**

- SE1 - Upgradient 200' above mill building.
- SE2 - Downgradient, across from Fluorocarbon Monoxide, approx. 100' from base of TPI.
- TP1 - Composite of subsamples TP1A-1 through 1A-4.
- TP2 - Composite of subsamples TP2A, 2B-1, and 2B-2.
- WR1 - Composite of subsamples WR1 through 3.
- WR2 - Composite of subsamples WR2A and 4B.
- BACKGROUND - From the Radio Meter (29-095-SE1).
- ADI - Collected at point of Adu 91.
- GW1 - Monitoring well at center of base of TPI.
- GW2 - Duplicate of GW1.
- GW3 - Drinking well sampled from vehicle tunnel.
- GW4 - QA/QC sample.
- SW1 - Same as sample 29-095-SE1.
- SW2 - Same as sample 29-095-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Belle</u>	County: <u>Madison</u>
Legal Description: <u>T 6S R 3W</u>	Section(s): <u>NE 1/4, SW 1/4, Section 35</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 16' 8.6"</u>	Primary Drainage: <u>Granite Creek</u>
Longitude: <u>W 111° 56' 6.8"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Alder Gulch</u>
Quad: <u>Virginia City</u>	Date Investigated: <u>July 19 and 20, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>29-098</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings observed at the site was estimated to be less than 5 cubic yards. The tailings were located in two separate piles on the mill foundation. The literature indicates that tailings were shipped off-site for processing. No tailings samples were submitted for analysis due to the small volume involved.
- The volume of waste rock observed at the site was estimated to be 7,645 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 3.0 to 80.5 mg/kg	Mercury: 0.24J to 1.31J mg/kg
Barium: 895 mg/kg	Nickel: 83.5 mg/kg
Cadmium: 2.8 to 8.1 mg/kg	Lead: 313 to 1,040 mg/kg
Cobalt: 26.2 to 34.1 mg/kg	Zinc: 367 to 991 mg/kg
Copper: 170 to 1,870 mg/kg	
- No discharging adits, seeps, or springs were observed at the site.
- Alder Gulch flows adjacent to the site on the east side, and a tributary to Alder Gulch flows adjacent to the site on the south side. No observed releases to surface water were documented during the investigation. No MCLs were exceeded in either of the streams; however, the chronic aquatic life criteria for mercury was exceeded in both streams upstream and downstream from the site.
- Potential safety hazards observed at the site included one open adit and several collapsing wooden structures.

**Belle Mine PA# 29-098**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - FLAMMANG**  
**INVESTIGATION DATE: 07/20/84**

**SOLID MATRIX ANALYSES**

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-098-SE1	1.0 U	7.7 U	45.4	0.9 U	5.6	22.4 JX	12.7 JX	11300	0.05 J	147	17.7 JX	17.2	11.8 UJ	39.1 JX	NR
29-098-SE2	0.8 U	6.2 U	76.8	0.7 U	6.5	36.4 JX	14.6 JX	11400	0.10 J	174	23.7 JX	8.17 U	9.5 UJ	40.5 JX	NR
29-098-SE3	0.9 U	6.9 U	135	0.8 U	9.1	37.8 JX	13.7 JX	21900	0.08 J	549	22.6 JX	10.6	10.7 UJ	39.5 JX	NR
29-098-WR1	2.0	26.6	187	1.1	34.1	86.1	170	35300	0.76 J	713	83.5	313	10.3 UJ	367	NR
29-098-WR2	80.5	24.8	895	8.1	8.1	10.4	1870	26100	1.31 J	679	11.9	1040	8.7 UJ	991	NR
29-098-WR3	3.0	19.4	210	2.8	26.2	64.9 JX	194 JX	33300	0.24 J	945	64.5 JX	607	8.8 UJ	377 JX	NR
BACKGROUND	0.8 U	9.2 B	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	678	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
29-098-WR1	0.10	3.12	30.4	27.3	<0.01	0.09	0.02	0.02	0.09	0.62	29.8	0.94	24.3	15.5		
29-098-WR2	0.25	7.81	25.2	17.4	0.10	0.03	<0.01	0.03	0.12	0.94	24.3	0.00	15.5			
29-098-WR3	0.01	0.31	15.5	15.2	<0.01	<0.01	<0.01	<0.01	0.02	0.00	15.5					

**WATER MATRIX ANALYSES**

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-098-SW1	0.12 U	1.1 U	66.2	4.0 U	8.4 U	6.8 U	7.8	188	0.10	9.6	14.4 U	1.0	51.6 U	15.6 U	157
29-098-SW2	0.12 U	1.1 U	70.0	4.0 U	8.4 U	6.8 U	5.9 U	125	0.11	3.7	14.4 U	1.3	51.6 U	15.6 U	171
29-098-SW3	0.12 U	1.1 U	60.9	4.0 U	8.4 U	6.8 U	5.9 U	639	0.12	18.5	14.4 U	1.3	51.6 U	16.6	107

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-098-SW1	182	<5	11	0.06	NR
29-098-SW2	188	<5	10	0.06	NR
29-098-SW3	264	<5	7	0.61	NR

**LEGEND**

- SE1 - Dissolved in Alder Gulch, approx. 200' from north end of mill.
- SE2 - Upgradient of site and confluence of unnamed trib. with Alder Gulch.
- SE3 - Upgradient of WR1, WR2 in unnamed trib., just above where road ends.
- WR1 - Composite of subsamples WR1A through 1C.
- WR2 - Grab sample of the WR2A subsample.
- WR3 - Composite of subsamples WR3A, SB, and GA.
- BACKGROUND - From the Belle Mine (29-098-SB1).
- SW1 - Same as sample 29-098-SE1.
- SW2 - Same as sample 29-098-SE2.
- SW3 - Same as sample 29-098-SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Kearsage</u>	County: <u>Madison</u>
Legal Description: <u>T 7S R 3W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 23</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 13' 00"</u>	Primary Drainage: <u>Alder Gulch</u>
Longitude: <u>W 111° 56' 00"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Mill Gulch</u>
Quad: <u>Cirque Lake</u>	Date Investigated: <u>July 20, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-102</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 8,780 cubic yards. The following elements were elevated at least three times background:

Arsenic: 25 mg/kg	Cadmium: 6.8J mg/kg
Chromium: 482 mg/kg	Copper: 78.1 to 111 mg/kg
Nickel: 224 mg/kg	Lead: 41 mg/kg
Zinc: 234 mg/kg	
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
- Mill Gulch was flowing adjacent to the site on the north side during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Mill Gulch. No MCLs or acute or chronic aquatic life criteria were exceeded in Mill Gulch.
- Observed releases to Mill Gulch (sediment) were documented for cadmium, lead, and zinc.
- Potentially hazardous mine openings identified at the site included one open adit and one open shaft. The shaft was surrounded by a barbed wire fence.

**Kearsage PA# 29-102**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/20/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-102-SE-1	5 U	54.4	0.9 J	9.1	31.7	17.7	12900	0.244	181	22	16	6 U	41	0.338 U
29-102-SE-2	5 U	111	2.8 J	18.5	83	41.2	26200	0.461	354	49	80	7 U	124	0.338 U
29-102-WR-1	25	122	6.8 J	45	160	78.1	61500	0.392	883	100	41	5 U	234	NR
29-102-WR-2	11	232	4.8 J	46.8	482	111	52200	0.679	452	224	29	5 U	183	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE	
	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x
29-102-WR-1	0.59	18.4	76.6	58.1	<0.01	15.6	0.5	0.16	0.03	0	0.03	60.9		
29-102-WR-2	<0.01	0	17.6	17.6	<0.01	0	<0.01	0	0	0	0	17.6		

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-102-SW-1	1.69 U	30.5	2.57 U	9.7 U	6.83 U	1.55 U	262	0.038 U	8.53	12.7 U	1.55 U	30.7 U	7.57 U	83.6
29-102-SW-2	1.69 U	31.7	2.57 U	9.7 U	6.83 U	1.55 U	319	0.038 U	9.4	12.7 U	1.55 U	30.7 U	7.57 U	85.3

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-102-SW-1	118	< 5.0	8	< 0.05	NR
29-102-SW-2	126	< 5.0	8	< 0.05	NR

**LEGEND**

SE1 - 300 feet upgradient from waste rock dump 1 in Mill Gulch.  
 SE2 - At PPE in Mill Gulch of waste rock dump 1.  
 WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A, 2B, 3, 4, and 5.  
 BACKGROUND - From the Apex Mine (29-105-SS-1).

SW1 - Same as SE1.  
 SW2 - Same as SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Apex</u>	County: <u>Madison</u>
Legal Description: <u>T 7S R 3W</u>	Section(s): <u>Center of N 1/2, Sec. 23</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock/Au, Talc</u>
Latitude: <u>N 45° 12' 05'</u>	Primary Drainage: <u>Ruby River</u>
Longitude: <u>W 111° 56' 00'</u>	USGS Code: <u>10020005</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Alder Gulch</u>
Quad: <u>Cirque Lake</u>	Date Investigated: <u>July 20, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>29-105</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 6,960 cubic yards. The following elements were elevated at least three times background:

Arsenic: 7 to 53 mg/kg	Cadmium: 7.2J to 14.3J mg/kg
Copper: 70.2 to 100 mg/kg	Lead: 210 to 212 mg/kg
Zinc: 260 to 1,030 mg/kg	
- One discharging adit was identified at the site during the investigation. However, the adit was actively being worked and could not be sampled due to inaccessibility.
- Alder Gulch was flowing adjacent to the site on the east side during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Alder Gulch; no MCLs or acute or chronic aquatic life criteria were exceeded.
- Potentially hazardous mine openings identified at the site included three open adits and one open shaft. The shaft was surrounded by a barbed wire fence.

Apex Mine PA# 29-105  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/20/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-105-SE-1	8 U	118	2.1 J	16.7	119	25.9	29400	0.486	408	60	17	10 U	95	NR
29-105-SE-2	9 U	63.3	1.6 J	19.8	51.3	32.5	26600	0.488	403	37	22	11 U	86	NR
29-105-WR-1	7	190	3.1 J	28.5	88.7	70.2	33100	0.345	387	73	12	6 U	68	NR
29-105-WR-2	33	193	7.2 J	36.2	105	83.4	49800	0.502	940	81	210	6 U	260	NR
29-105-WR-3	53	29.7	14.3 J	35.9	80.6	100	54200	0.552	941	92	212	5 U	1030	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		SULFUR ACID BASE	
	%	U/1000x	POTENTIAL	U/1000x	POTENTIAL	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	POTENTIAL	U/1000x
29-105-WR-1DUP	0.22	6.87	72.9	66.1	66.1	66.1	0.16	5	0.12	0.12	0.12	5	4.37	67.9		
29-105-WR-1	0.23	7.19	73.5	66.3	66.3	66.3	0.14	5	0.13	0.13	0.13	5	55.7	69.1		
29-105-WR-2	0.26	8.12	60.7	52.6	52.6	52.6	0.16	5	0.12	0.12	0.12	5	34.7	55.7		
29-105-WR-3	1.12	35	75.5	40.5	40.5	40.5	1.11	34.7	0.37	0.37	0.37	40.8		40.8		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-105-SW-1	1.69 U	32.6	2.57 U	9.7 U	6.83 U	1.55 U	17.3	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	183
29-105-SW-2	1.69 U	34.6	2.57 U	9.7 U	6.83 U	1.55 U	42	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	186

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-105-SW-1	244	< 5.0	7	0.17	NR
29-105-SW-2	211	< 5.0	7	0.21	NR

LEGEND

- SEB1 - Approx 1,000' upgradient from waste rock dump 6 in Alder Gulch.  
SEB2 - Approx. 50' downgradient from waste rock dump 6.  
WR1 - Composite of subsamples WR-1A through 1C.  
WR2 - Composite of subsamples WR2A, 2B, 3A, 3B, and 4.  
WR3 - Composite of subsamples WR5 and 6.  
(See JTC 29-105 for WR4 information).  
BACKGROUND - From the Apex (29-105-SS-1).
- WR1DUP - Duplicate of sample 29-105-WR-1.  
SW1 - Same as sample SEB1.  
SW2 - Same as sample SEB2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Pacific</u>	County: <u>Madison</u>
Legal Description: <u>T 7S R 3W</u>	Section(s): <u>NW 1/4, Sec. 15</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 13' 45"</u>	Primary Drainage: <u>Alder Gulch</u>
Longitude: <u>W 111° 57' 03"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Browns Gulch</u>
Quad: <u>Cirque Lake</u>	Date Investigated: <u>August 26, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>29-118</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 190,000 cubic yards. The following elements were elevated at least three times background:

Cadmium: 0.88J mg/kg	Chromium: 286JX mg/kg
Copper: 112 mg/kg	Mercury: 0.071J to 0.253J mg/kg
Nickel: 149JX mg/kg	Lead: 30.8JX mg/kg
- Three discharging adits were identified at the site during the investigation. Two of the discharges eventually flowed into Brown's Gulch; one of these discharges was sampled for laboratory analyses. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded.
- Brown's Gulch was flowing through the center of the site during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Brown's Gulch. No MCLs were exceeded; however, the chronic aquatic life criteria for mercury was exceeded in both the upstream and downstream samples. An observed release to Brown's Gulch was documented for lead. Additionally, observed releases to Brown's Gulch (sediment) were documented for mercury and lead.
- Three potentially hazardous open adits and one 200 feet tall highwall were identified at the site.

Pacific PA# 29-118  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-118-SE-1	6.99	110 J	1.37 J	11.5	33.8 JX	26.3	24600	0.056 J	444 J	30.9 JX	36.2 JX	6.91 UJ	110 J	NR
29-118-SE-2	7.35	356 J	2.57 J	14.1	18.7 JX	62.6	27200	0.437 J	424 J	24.9 JX	189 JX	6.9 UJ	310 J	NR
29-118-WR-1	7.42	91.2 J	0.88 J	24.2	286 JX	112	34400	0.253 J	494 J	149 JX	20.8 JX	5.86 UJ	74.9 J	NR
29-118-WR-2	4.49 U	100 J	0.86 UJ	11.1	21.2 JX	31.8	25700	0.072 J	490 J	24.2 JX	30.8 JX	5.93 UJ	91.7 J	NR
BACKGROUND	12.8	123 J	1.02 UJ	8.77	22.4 JX	26.4	22400	0.031 UJ	539 J	16.4 JX	7.26 UJX	7.01 UJ	52.4 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
29-118-WR-1	0.08	2.5	76.4	73.9	<0.01	0.04	0.04	1.25	0.04	1.25	0.04	1.25	75.2	139
29-118-WR-2	0.3	9.37	140	131	0.07	0.19	0.04	1.25	0.19	1.25	0.04	1.25	139	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-118-SW-1	1.12 U	32.2	4.59 U	5 U	6.24 U	3.67 J	59.6 J	0.2	7.47	10.9 U	0.94 U	31.7 U	33.5	105
29-118-SW-2	1.08	66.9	2.57 U	9.7 U	6.83 U	1.55 U	251	0.16 JX	55.8	12.7 U	3.66 J	30.7 U	27.8 J	171
29-118-SW-3	1.83	99.3	2.57 U	9.7 U	6.83 U	1.97	900	0.14 JX	174	13.8	1.98 J	30.7 U	36.1 J	233

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-118-SW-1	114 < 5.0	8	2424	NR	NR
29-118-SW-2	1080 < 5.0	38	2424	0.05	NR
29-118-SW-3	268 < 5.0	38	2424	0.05	NR

LEGEND

- SE1 - 400 feet upgradient of waste rock dump 2.  
SE2 - 50 feet downgradient of culvert where creek crosses road at base of waste rock dump 1.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Composite of subsamples WR2A, 2B, 3A, 3B, 4A, and 4B.  
BACKGROUND - 275' above waste rock dump 4. From Pacific (29-118-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Add discharge across road from waste rock dump 1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Easton</u>	County: <u>Madison</u>
Legal Description: <u>T 7S R 3W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 4</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 45° 15.0'</u>	Primary Drainage: <u>Alder Gulch</u>
Longitude: <u>W 111° 58.1</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Browns Gulch</u>
Quad: <u>Virginia City/Cirque Lake</u>	Date Investigated: <u>August 26, 1993</u>
Inspectors: <u>Babits, Flammang/Pierson</u>	P.A. # <u>29-121</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 1,500 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 52.9 mg/kg                      Barium: 455J mg/kg  
Cadmium: 45.2J mg/kg                      Copper: 489 mg/kg  
Mercury: 1.47J mg/kg                      Lead: 2,670JX mg/kg  
Antimony: 107J mg/kg                      Zinc: 3,650J mg/kg
- The volume of waste rock associate with this site was estimated to be approximately 7,100 cubic yards. The following elements were elevated at least three times background:  
Copper: 111 mg/kg                      Mercury: 0.18J mg/kg  
Lead: 94.2JX mg/kg                      Zinc: 158J mg/kg
- One discharging adit was identified at the site; this discharge eventually entered Mill Creek. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded. The pH measurement in the adit discharge was 7.5.
- Mill Creek was flowing through the center of the site during the investigation. Surface water and sediment samples were collected upstream and downstream from the site in Mill Creek. No MCLs were exceeded in Mill Creek; however, the chronic aquatic life criteria for mercury was exceeded in both the upstream and downstream samples.
- One potentially hazardous partially collapsed adit was identified at the site.

Easton PA# 29-121  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/26/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-121-SE-1	4.56 U	33.4 J	0.88 UJ	3.2	9.06 JX	5.67	11200	0.036 J	98.4 J	6.86 JX	7.67 JX	6.04 UJ	38.9 J	NR
29-121-SE-2	5.48 U	23.1 J	1.05 UJ	2.08	6.91 JX	6.93	8320	0.034 J	125 J	5.7 JX	14.3 JX	7.24 UJ	60.2 J	NR
29-121-TP-1	52.9	455 J	45.20 J	6.43	10.6 JX	489	27900	1.47 J	273 J	22.9 JX	2670 JX	107 J	3650 J	<0.306
29-121-WR-1	25	257 J	1.87 J	10.5	10.6 JX	111	30100	0.18 J	406 J	25.6 JX	94.2 JX	11.8 J	158 J	NR
BACKGROUND	12.8	123 J	1.02 UJ	8.77	22.4 JX	26.4	22400	0.031 UJ	539 J	16.4 JX	7.26 UJX	7.01 UJ	52.4 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT.	
	%	/1000x	%	/1000x	%	/1000x	%	/1000x	%	/1000x	%	/1000x	%	/1000x
29-121-TP-1	1.23	38.4	47.1	8.69	0.48	0.74	0.01	23.1	0.01	24	23.1	10.6	24	51.4
29-121-WR-1	0.66	20.6	62	41.4	0.13	0.34	0.19	10.6	0.19	51.4	10.6			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-121-SW-1	1.12 U	73	4.59 U	5 U	6.24 U	2.33 U	286 J	0.22	11.8	10.9 U	3.18	31.7 U	8.71 U	129
29-121-SW-2	1.12 U	78.4	4.59 U	5 U	6.24 U	2.33 U	270 J	0.2	11	10.9 U	3.78	31.7 U	19.7	360
29-121-SW-3	1.32	55	4.59 U	5 U	6.24 U	3.8 J	51.9 J	0.27	5	10.9 U	0.99	31.7 U	34.1	814

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-121-SW-1	164 <	5.0	39 <	0.05	NR
29-121-SW-2	403 <	5.0	116	0.16	NR
29-121-SW-3	901 <	5.0	249 <	0.05	NR

LEGEND

- SE1 - 50 feet upgradient above last cabin.  
SE2 - Downgradient of waste rock dump 2.  
TP1 - Composite of subsamples TP1A and 1B.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.  
BACKGROUND - From the Pacific Mine (29-118-SB-1).
- SW1 - Same as SE1.  
SW2 - Same as SE2.  
SW3 - Discharge from edit #1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Prospect Mine and Millsite</u>	County: <u>Madison</u>
Legal Description: <u>T 6S R 3W</u>	Section(s): <u>SE 1/4, Se 1/4, Section 21: NW 1/4, NW 1/4, Section 27</u>
Mining District: <u>Virginia City</u>	Mine Type: <u>Hardrock: Millsite/Au. Ag. Pb. Zn. Cu</u>
Latitude: <u>N 45° 17' 30"</u>	Primary Drainage: <u>Granite Creek</u>
Longitude: <u>W 111° 57' 45"</u>	USGS Code: <u>10020003</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Alder Gulch</u>
Quad: <u>Virginia City</u>	Date Investigated: <u>July 19, 1994</u>
Inspectors: <u>Flammang, Clark, West</u>	P.A. # <u>29-136</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- Areas of the mine were being actively re-worked during the investigation.
- The volume of tailings observed at the site was estimated to be 17,440 cubic yards. The following elements were elevated to at least three times the background concentrations:

Silver: 4.5 to 6.0 mg/kg	Mercury: 0.73J to 0.77J mg/kg
Arsenic: 50.0 to 59.6 mg/kg	Lead: 467 to 698 mg/kg
Barium: 2,950 to 3,250 mg/kg	Copper: 76.4 to 80.1 mg/kg
- The volume of waste rock observed at the site was estimated to be 18,590 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 38.4 mg/kg
Lead: 147 mg/kg
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Intermittent Barton Gulch (dry during investigation) flows through the center of the site. Tailings make up the majority of the surface sediment in Barton Gulch for at least 1,200 feet downstream from the site. Observed releases to Barton Gulch (sediment) were documented for silver, barium, copper, mercury, and lead.
- Potential safety hazards observed at the site included several undercut banks along tailings piles located near Barton Gulch.

Prospect PA# 29-136  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - FLAMMANG  
INVESTIGATION DATE: 07/19/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-136-SE1	5.8	19.2	823	0.8	4.7	20.4	47.3	12300	0.27 J	267	16.1	315	9.0 UJ	79.2	NR
29-136-SE2	0.6 U	7.5	92.2	0.6 U	7.0	23.2	12.9	10200	0.07 J	217	17.8	10.8	7.7 UJ	28.9	NR
29-136-TP1	4.5	50.0	2950	0.7 U	3.6	36.7	76.4	20800	0.77 J	200	22.3	467	8.8 UJ	81.6	0.563
29-136-TP2	6.0	59.6	3250	0.9 U	3.9	40.6	80.1	20700	0.73 J	197	24.6	698	11.1 UJ	146	0.699
29-136-WR1	0.8 U	38.4	108	0.7 U	14.6	79.2	38.5	27200	0.12 J	216	59.7	147	9.6 UJ	80.4	NR
BACKGROUND	0.8 U	9.2	210	0.7 U	8.6	37.1 JX	19.5 JX	19700	0.06 J	678	24.6 JX	14.8	9.0 UJ	101 JX	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. v/1000	NEUTRAL. POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000
29-136-TP1	0.07	2.19	10.6	8.36	0.07	<0.01	<0.01	0.00	10.6
29-136-WR1	0.01	0.31	18.9	18.6	0.01	<0.01	<0.01	0.00	18.9

LEGEND

SE1 - Downgradient of leachate TP2 dam approx. 50'.  
SE2 - Approx. 15' downgradient of monitoring well.  
TP1 - Composite of subsamples TP1A-1 and 1A-2.  
TP2 - Composite of subsamples TP2A-1, 2A-2, 2B-1, and 2B-2.  
BACKGROUND - From the Bulk Index (29-114-SB1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

<b>Mine/Site Name:</b> <u>Missouri</u>	<b>County:</b> <u>Madison</u>
<b>Legal Description:</b> <u>T 4S R 2W</u>	<b>Section(s):</b> <u>N 1/2, NE 1/4, Sec. 30; S 1/2, Sec. 29</u>
<b>Mining District:</b> <u>Washington</u>	<b>Mine Type:</b> <u>Hardrock/Au, Ag, Pb, Cu</u>
<b>Latitude:</b> <u>N 45° 27' 32"</u>	<b>Primary Drainage:</b> <u>Madison River</u>
<b>Longitude:</b> <u>W 111° 53' 27"</u>	<b>USGS Code:</b> <u>10020007</u>
<b>Land Status:</b> <u>Private/Public</u>	<b>Secondary Drainage:</b> <u>South Meadow Creek</u>
<b>Quad:</b> <u>Ramshorn Mountain</u>	<b>Date Investigated:</b> <u>July 22, 1993</u>
<b>Inspectors:</b> <u>Babits, Lasher/Pierson</u>	<b>P.A. #</b> <u>29-373</u>
<b>Organization:</b> <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 12,111 cubic yards. The following elements were elevated at least three times background:

Arsenic: 3,390 to 6,520 mg/kg	Cadmium: 3.6 to 10.6 mg/kg
Copper: 364 to 692 mg/kg	Iron: 79,100 mg/kg
Mercury: 0.791 to 3.68 mg/kg	Lead: 536 to 11,900 mg/kg
Antimony: 76 to 107 mg/kg	Zinc: 426 to 1,080 mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 5,960 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1,730 mg/kg	Cadmium: 9.8 mg/kg
Copper: 255 mg/kg	Mercury: 0.285 to 0.897 mg/kg
Lead: 3,520 mg/kg	Antimony: 38 mg/kg
Zinc: 682 mg/kg	
  
- No discharging adits, filled shafts, seeps, or springs were identified at the site.
  
- South Meadow Creek was flowing adjacent to the site on the south side. Surface water and sediment samples were collected upstream and downstream from the site in South Meadow Creek. No MCLs were exceeded in South Meadow Creek; however, the chronic aquatic life criteria for lead was exceeded in both the upstream and downstream samples.
  
- Observed releases to South Meadow Creek (sediment) were documented for arsenic and lead.
  
- Two potentially hazardous open adits were identified at the site.

Missouri PA# 29-373  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/22/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-373-SE-1	16	86.7	0.5 U	8.5	38.1	17.6	13000	0.054	362 J	22	42	6 U	57	0.323 U
29-373-SE-2	290	68.6	0.6 U	11	41.2	45.3	20300	0.089	249 J	32	536	9	99	0.397 U
29-373-TP-1	6520	92.7	10.6	8	51.5	692	79100	3.68	138 J	18	11900	107	1080	0.317
29-373-TP-2	3390	35.2	3.6	4.3	24.5	364	44000	0.791	76.1 J	8	6680	76	426	0.308
29-373-WR-1	1730	103	9.8	28.5	34.3	255	47400	0.897	784 J	47	3520	38	682	NR
29-373-WR-2	5	219	0.5 U	34.9	76.2	65.3	30700	0.285	330 J	62	12	5 U	59	NR
BACKGROUND	10	129	0.6 U	16.6	57.6	28.4	21600	0.029	951 J	51	23	7 U	54	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENTIAL	SULFUR ACID BASE POTENTIAL	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENTIAL	SULFUR ACID BASE POTENTIAL
29-373-TP-1	0.31	9.68	5.88	-3.8	<0.01	<0.01	0	5.88
29-373-TP-2	0.19	5.84	2.73	-3.2	<0.01	<0.01	0	2.73
29-373-WR-1	0.07	2.19	28.9	26.7	<0.01	<0.01	0	28.9
29-373-WR-2	0.01	0	7.11	7.11	<0.01	<0.01	0	7.11

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-373-SW-1	2.34	12.3 JX	2.57 U	9.7 U	6.97 J	1.63 J	43.7 J	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	20
29-373-SW-2	3.35	12.3 JX	2.57 U	9.7 U	6.83 U	1.7 J	48.6 J	0.038 U	4.08 U	12.7 U	0.89 J	30.7 U	7.57 U	23.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-373-SW-1	75	< 5.0	< 5.0	< 0.05	NR
29-373-SW-2	71	< 5.0	< 5.0	< 0.05	< 0.01

LEGEND

- SE1 - 800 feet upgradient of tailings pond 1 in S. Meadow Creek.  
SE2 - At PPE of tailings pond 1 in S. Meadow Creek.  
TP1 - Composite of subsamples TP1A-C and 1A-B.  
TP2 - Composite of subsamples TP1A-C and 1A-D.  
WR1 - Composite of subsamples WR1, 2A, 2B, 3A, and 3B.  
WR2 - Composite of subsamples WR4, 5, and 6.  
BACKGROUND - From the Missouri Mine (29-373-SW-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>SE SE S25</u>	County: <u>Madison</u>
Legal Description: <u>T 4S R 3W</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 25</u>
Mining District: <u>Washington</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 27' 18"</u>	Primary Drainage: <u>Madison River</u>
Longitude: <u>W 111° 54' 20"</u>	USGS Code: <u>10020007</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>South Meadow Creek</u>
Quad: <u>Ramshorn Mountain</u>	Date Investigated: <u>September 20, 1993</u>
Inspectors: <u>M. Babits, S. Babits</u>	P.A. # <u>29-394</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 4,600 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1,110 mg/kg	Cadmium: 7 mg/kg
Cobalt: 52.6 mg/kg	Copper: 525 mg/kg
Mercury: 0.221 mg/kg	Lead: 1,660 mg/kg
Antimony: 23J mg/kg	Zinc: 1,090 mg/kg
- One discharging adit was identified at the site. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria for copper and zinc were exceeded. The chronic aquatic life criteria for lead was also exceeded. The adit discharge pH measurement was 7.75.
- No surface water was observed on or near the site. The nearest surface water was located approximately 600 feet away. No surface water or sediment samples were collected due to a lack of a direct runoff route.
- Two potentially hazardous open adits were identified at the site.

SE SE Section 25 PA# 29-394  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/20/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-394-WR-1	1110	109	7	52.6	46.5	525	59400	0.221	1700 J	61.3	1660	23 J	1090	NR
BACKGROUND	10	129	0.6 U	16.6	57.6	28.4	21600	0.029	951 J	51	23	7 U	54	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL		SULFUR ACID BASE POTENTIAL	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
29-394-WR-1	0.2	6.25	2.89	-3.4	0.14	<0.01	0.07	0	2.89							

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-394-SW-1	32.9 J	3.73	4.59 U	5 U	6.24 U	13.1	20.3 JX	0.12 U	3.76 UJ	10.9 U	2.78 J	31.7 U	59.9	35.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-394-SW-1	61	< 5	8	0.11	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.  
BACKGROUND - From the Missouri Mine (29-373-SS-1).  
SW1 - Acid discharge at waste rock dump 2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bigler</u>	County: <u>Meagher</u>
Legal Description: <u>T 9N R 4E</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 28</u>
Mining District: <u>Beaver Creek</u>	Mine Type: <u>Hardrock/Au, Ag, Cu</u>
Latitude: <u>N 46° 15' 30"</u>	Primary Drainage: <u>Thompson Gulch</u>
Longitude: <u>W 111° 15' 30"</u>	USGS Code: <u>10030103</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Thompson Gulch</u>
Quad: <u>Gipsy Lake</u>	Date Investigated: <u>July 28, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>30-067</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 25 cubic yards. This was a very small volume of tailings in a secure impoundment. The following elements were elevated at least three times background:  
Cadmium: 2.4JX mg/kg                      Copper: 1020J mg/kg  
Iron: 66,400 mg/kg                      Nickel: 25 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 7500 cubic yards. Copper (262J mg/kg) was the only element elevated at least three times background.
- There were two adit discharges associated with this site. Neither discharge exceed any of the applicable MCLs or MCLGs. The acute aquatic life criteria for cadmium was exceeded in both adits. The pH of both discharges was greater than 8.5 and the specific conductance of both discharges is 160 umhos/cm. Both discharges returned to subsurface prior to discharging into the drainage approximately 1/3 mile below the site.

**Bigler PA# 30-067**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 07/28/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
30-067-TP-1	10 J	88.8 J	2.4 JX	11.7 J	13.7 J	1020 J	66400	0.05 J	987 J	25 J	42 J	7 U	52 J	NR
30-067-WR-1	5 J	60.7 J	0.9 JX	10.5 J	9.8 J	262 J	24900	0.029 J	634 J	11 J	31 J	5 U	50 J	NR
BACKGROUND	24 J	116 J	0.8 UX	5.2 J	12.2 J	20.2 J	13400	0.032 J	361 J	7 J	19 J	10 U	39 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		SULFUR ACID BASE		POTENTIAL
	SULFUR %	ACID BASE v/1000	POTENTIAL v/1000	NEUTRAL POTENTIAL v/1000	ACID BASE v/1000	ACID BASE v/1000	SULFATE %	SULFATE %	PYRITIC %	PYRITIC v/1000	ORGANIC %	ORGANIC v/1000	SULFUR v/1000	ACID BASE v/1000	
30-067-TP-1	0.37	11.6	42.3	30.7	0.37	0.37	0.07	0.07	<0.01	0.00	<0.01	0.00	42.3	42.3	
30-067-WR-1	0.07	2.19	10.5	8.36	0.07	0.07	0.07	0.07	<0.01	0.00	<0.01	0.00	10.5	10.5	
30-067-WR-1DUP	0.07	2.19	11.8	9.62	0.07	0.07	0.07	0.07	<0.01	0.00	<0.01	0.00	11.8	11.8	

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
30-067-GW-1	1.69 U	2.27	2.57 U	9.7 U	6.83 U	4.37 J	34.4 J	0.074	4.08 U	12.7 U	1.55 U	30.7 U	14.9 JX	61.4
30-067-GW-2	1.69 U	3.3	2.57 U	9.7 U	6.83 U	3.77 J	20.7 J	0.048	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	61.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
30-067-GW-1	104	< 5.0	9	0.28	NR
30-067-GW-2	103	< 5.0	< 5.0	0.63	NR

**LEGEND**

TP1 - Composite of subsamples TP1A and 1B.  
 WR1 - Composite of subsamples WR1A, 1B, 2A, and 4A.  
 BACKGROUND - From the Lane Mine (30-019-S9-1).  
 WR1DUP - Duplicate of the 30-067-WR-1 sample.

GW1 - Adit #2 discharge.  
 GW2 - Adit #3 discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Cumberland</u>	County: <u>Meagher</u>
Legal Description: <u>T 8N R 8E</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 14</u>
Mining District: <u>Castle Mountain</u>	Mine Type: <u>Hardrock/Pb, Ag</u>
Latitude: <u>N 46° 27' 08"</u>	Primary Drainage: <u>Alabaugh Creek</u>
Longitude: <u>W 110° 40' 57"</u>	USGS Code: <u>10040201</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Castle Creek</u>
Quad: <u>Castle Town</u>	Date Investigated: <u>July 29, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A.# <u>30-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There was a small amount of slag at the site. The following were elevated at least 3 times background:
  - Arsenic: 861J mg/kg
  - Cadmium: 7.8JX mg/kg
  - Iron: 143,000 mg/kg
  - Manganese: 4,740J mg/kg
  - Lead: 25,900J mg/kg
  - Antimony: 36 mg/kg
  - Zinc: 13,000J mg/kg
- There were approximately 20,680 cubic yards of mostly uncovered waste rock on site. The following were elevated at least 3 times background:
  - Arsenic: 542J to 574J mg/kg
  - Cadmium: 7.2JX to 9.6JX mg/kg
  - Mercury: 0.191J to 0.196J mg/kg
  - Lead: 15,200J to 52,500J mg/kg
  - Antimony: 22 to 40 mg/kg
  - Zinc: 990J to 2,000J mg/kg
- There were no discharging adits at the site.
- Castle Creek flows 60 feet from the slag. Observed releases of manganese and lead to downstream surface water were documented. No MCL/MCLGs were exceeded, but the chronic fresh water aquatic life criteria for mercury and lead were exceeded in downstream surface water.
- There were two open shafts at the site (one had been fenced but the fence was down).

Cumberland PA# 30-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/29/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
30-004-SE-1	37 J	136 J	1.9 JX	6.6 J	11.9 J	15.5 J	13300	0.083 J	924 J	11 J	409 J	7 U	108 J	NR
30-004-SE-2	61 J	191 J	2 JX	7.2 J	21.5 J	28.7 J	19200	0.106 J	975 J	17 J	1130 J	10 U	265 J	NR
30-004-SL-1	861 J	406 J	7.8 JX	6.2 J	11.6 J	298 J	143000	0.009 UJ	4740 J	3 J	25900 J	36	13000 J	NR
30-004-WR-1	542 J	48.4 J	9.6 JX	3.4 J	13.1 J	133 J	22800	0.191 J	566 J	12 J	52500 J	40	990 J	NR
30-004-WR-2	574 J	58.4 J	7.2 JX	2.1 U	9.6 J	160 J	34600	0.196 J	1480 J	5 J	15200 J	22	2000 J	NR
BACKGROUND	63	154 J	2.2	21.9 J	21.4	396 J	46600	0.062 J	878	21 J	52 J	6 U	135 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	TOTAL	ACID BASE	ACID BASE	POTENT.	POTENT.	ACID BASE	POTENT.	ACID BASE	SULFUR	%	SULFUR	ACID BASE	SULFUR	%	SULFUR	ACID BASE	POTENT.	%
30-004-SL-1	1.62	50.6	50.6	150	150	99.0	99.0	<0.01	<0.01	<0.01	<0.01	0.00	3.33	0.00	150	0.00	150	0.00
30-004-WR-1	0.21	6.56	6.56	578	578	572	572	<0.01	<0.01	0.17	0.17	5.31	0.39	5.31	573	5.31	573	0.39
30-004-WR-2	2.02	63.1	63.1	419	419	356	356	<0.01	<0.01	1.55	1.55	48.4	1.53	48.4	370	48.4	370	1.53

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
30-004-SW-1	3.69	19	2.57 U	9.7 U	6.83 U	1.55 U	60.1 J	0.097	4.08 U	12.7 U	1.14 J	30.7 U	7.57 U	40.2
30-004-SW-2	3.77	24.8	2.57 U	9.7 U	6.83 U	1.55 U	178 J	0.11	16.1	12.7 U	6.5 J	30.7 U	7.57 U	53.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL	DISOLVED	SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
30-004-SW-1	79	< 5.0	< 5.0	5	< 0.05	NR	NR
30-004-SW-2	92	< 5.0	< 5.0	5	0.08	NR	NR

LEGEND

- SE1 - Upgradient (approx. 100' from site) in Castle Creek.  
SE2 - 50 feet downgradient of slag pile in Castle Creek.  
SL1 - Small waste rock pile near middle.  
WR1 - Composite of subsamples WR2A, 2B, 2C, 2D, 2E, and 2F.  
WR2 - Composite of subsamples WWR1A, 1B, 3, and 4.  
BACKGROUND - From the Belle of the Castles (30-007-S5-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Belle of the Castle</u>	County: <u>Meagher</u>
Legal Description: <u>T 8N R 8E</u>	Section(s): <u>NE 1/4, SW 1/4, SW 1/4, Sec. 2</u>
Mining District: <u>Castle Mountain</u>	Mine Type: <u>Hardrock/Pb, Cu, Fe, Ag</u>
Latitude: <u>N 46° 28' 55"</u>	Primary Drainage: <u>Alabaugh Creek</u>
Longitude: <u>W 110° 41' 32"</u>	USGS Code: <u>10040201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Hensley Creek</u>
Quad: <u>Castle Town</u>	Date Investigated: <u>July 29, 1993</u>
Inspectors: <u>July 29, 1993</u>	P.A. # <u>30-007</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be 5,500 cubic yards. The following elements were elevated at least three times background:  
Copper: 1,810J to 2,210J mg/kg      Lead: 402 mg/kg
- One discharging adit was observed at the site during the investigation. The MCL and the acute and chronic aquatic life criteria for copper were exceeded in the adit discharge. The chronic aquatic life criteria for iron, mercury, and lead were also exceeded in the adit discharge.
- Hensley Creek was flowing through the site. An observed release to Hensley Creek was documented for copper in water and sediment samples. Acute and chronic aquatic life criteria were exceeded for copper in the downstream sample; these exceedances were attributable to the site.
- One potentially hazardous adit opening was observed at the site.

**Belle of the Castles PA# 30-007**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 07/29/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
30-007-SE-1	20 J	192 J	3.6 JX	20.4 J	12 J	55.9 J	24800	0.026 UJ	533 J	20 J	107 J	15 U	344 J	NR
30-007-SE-2	69 J	860 J	4.1 UX	74.5 J	25.5 J	5510 J	90200	0.08 J	1220 J	20 J	105 J	48 U	265 J	NR
30-007-SE-3	17 J	173 J	2 JX	22.7 J	10.6 J	248 J	40000	0.029 J	988 J	15 J	124 J	11 U	231 J	NR
30-007-WR-1	61 J	238 J	2.6 JX	38.5 J	9.4 J	1810 J	45800	0.024 J	2100 J	16 J	402 J	7 U	145 J	NR
30-007-WR-2	25 J	127 J	2.4 JX	28.8 J	20.7 J	2210 J	48400	0.101 J	375 J	18 J	35 J	5 U	46 J	NR
BACKGROUND	63	154 J	2.2	21.9 J	21.4	396 J	46600	0.062 J	878	21 J	52 J	6 U	135 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000r	ACID BASE v/1000r	POTENT. v/1000r	ACID BASE v/1000r	POTENT. v/1000r	ACID BASE v/1000r	POTENT. v/1000r	SULFUR %	SULFATE %	SULFUR %	ACID BASE v/1000r	SULFUR %	ACID BASE v/1000r	ACID BASE v/1000r	POTENT. v/1000r	ACID BASE v/1000r	POTENT. v/1000r
30-007-WR-1	0.01	0.31	0.31	8.39	8.39	8.08	0.01	0.01	0.01	0.01	<0.01	0.00	0.01	0.01	0.00	8.39	8.39	8.39
30-007-WR-2	0.10	3.12	3.12	6.88	6.88	3.76	0.07	0.07	0.07	0.07	<0.01	0.00	0.03	0.03	0.00	6.88	6.88	6.88

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
30-007-SW-1	2.5	33.9	2.57 U	9.7 U	6.83 U	1.55 U	46.2 J	0.12	5.6	12.7 U	0.72 U	30.7 U	18.9	11
30-007-SW-2	2.7	40.9	2.57 U	9.7 U	6.83 U	42.2	171 J	0.072	10.5	12.7 U	0.72 U	30.7 U	20.6	11.8
30-007-SW-3	3.63	33.4	2.57 U	9.7 U	6.83 U	3.6	55.4 J	0.063	5.6	12.7 U	0.72 U	30.7 U	18.8	14.2
30-007-SW-4	11.9	22.2	2.57 U	13	6.83 U	3320	18900 J	0.11	384	14.4	9.28 J	30.7 U	51.9	65.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
30-007-SW-1	49	< 5.0	6	< 0.05	NR
30-007-SW-2	48	< 5.0	7	< 0.05	NR
30-007-SW-3	51	< 5.0	6	< 0.05	NR
30-007-SW-4	150	< 5.0	50	< 0.05	NR

**LEGEND**

- SE1 - Upgradient of discharging edit in Hensley Creek.  
 SE2 - Immediately downgradient of edit discharge in Hensley Creek.  
 SE3 - Downgradient below confluence with unnamed tributary of Hensley Creek.  
 WR1 - Composite of subsamples WR1A and 1B.  
 WR2 - Composite of subsamples WR2A, 2B, 3A, 3B, and 3C.  
 BACKGROUND - Approx. 100' NW of upper, 30' above road.  
 From Belle of the Castles (30-007-SB-1).
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Same as sample SE3.  
 SW4 - Edit discharge of waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>SW NE S10</u>	County: <u>Meagher</u>
Legal Description: T <u>11N</u> R <u>7E</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 10</u>
Mining District: <u>Smith River</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 48' 01"</u>	Primary Drainage: <u>Newland Creek</u>
Longitude: <u>W 110° 49' 42"</u>	USGS Code: <u>10030103</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Newland Creek</u>
Quad: <u>Charcoal Gulch</u>	Date Investigated: <u>July 28, 1993</u>
Inspectors: <u>Bullock, Clark/Pierson</u>	P.A. # <u>30-078</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 10,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 57J mg/kg	Lead: 757J to 3,640J mg/kg
Cadmium: 4.8JX to 6.6JX mg/kg	Antimony: 116 mg/kg
Copper: 70.5J to 104J mg/kg	Zinc: 512J mg/kg
Mercury: 4.35J mg/kg	
- No discharging adits, seeps, or springs were observed at the site during the investigation. One shaft containing water was identified on site and was sampled for field parameters; two very small precipitation ponds located on the waste rock dumps were also sampled for field parameters. A residential well located downgradient from the site was sampled for laboratory analyses. No MCLs were exceeded in the well sample.
- A potentially hazardous flooded shaft (reportedly up to 100 feet deep) was identified at the site. Potential hazards observed on-site included a 40 feet tall highwall and two collapsing wooden cabins.

SW NE Section 10 PA# 30-078  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
30-078-WR-1	23 J	40.1 J	4.8 JX	2.1 U	1.5 U	104 J	3640	4.35 J	0.9 U	3 U	3640 J	116	324 J	NR
30-078-WR-2	57 J	177 J	6.6 JX	6.4 J	11.1 J	70.5 J	29600	4.35 J	195 J	23 J	757 J	12	512 J	NR
BACKGROUND	18 J	121 J	1.4 JX	8.1 J	9.2 J	19.3 J	24100	0.038 J	579 J	19 J	68 J	7 U	125 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	U/1000	U/1000
30-078-WR-1	0.86	26.9	-3.34	-30.2	0.43	0.43	0.40	0.94	0.03	0.03	0.40	0.03	0.94	0.00	-4.27	-0.95
30-078-WR-2	0.45	14.1	-0.95	-15.0	0.42	0.42	0.03	0.00	<0.01	<0.01	0.03	0.03	0.00	0.00	-0.95	-0.95

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
30-078-GW-1	1.69 U	81.8	2.57 U	9.7 U	6.83 U	5.77 J	45.9 J	0.096	4.08 U	12.7 U	1.55 U	30.7 U	15.9 JX	334
30-078-GW-2	3.21	90.7	2.57 U	9.7 U	6.83 U	3.73	34.7 J	0.13	4.08 U	12.7 U	1.01 J	30.7 U	7.9	370

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
30-078-GW-1	387	< 5.0	87	0.15	NR
30-078-GW-2	374	< 5.0	90	0.16	NR

LEGEND

WR1 - Sample of the subsample WR1.

WR2 - Composite of subsamples WR2A, 2B, and 2C.

BACKGROUND - From the SW NE Sec. 10 (30-078-SS-1).

GW1 - Residential well in drainage below mine.

GW2 - QA/QC duplicate of 30-078-GW-1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Iron Mountain Millsite</u>	County: <u>Mineral</u>
Legal Description: <u>T 17N R 26W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 13</u>
Mining District: <u>Iron Mountain</u>	Mine Type: <u>Millsite/Cu, Pb, Au, Ag, Zn</u>
Latitude: <u>N 47° 14' 25"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 51' 10"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Flat Creek</u>
Quad: <u>Idaho Gulch</u>	Date Investigated: <u>July 22, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>31-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with the site was estimated to be approximately 368 cubic yards for the upper two tailings piles. Tailings were observed in the Flat Creek floodplain for approximately three miles downstream. The following elements were elevated at least three times background:

Arsenic: 1470 to 2120 mg/kg	Cadmium: 43.3 to 210 mg/kg
Copper: 68 to 319 mg/kg	Iron: 54,000 mg/kg
Mercury: 6.66 to 32.6 mg/kg	Manganese: 2010J to 2080J mg/kg
Lead: 12,700 to 13,500 mg/kg	Antimony: 2390 to 3970 mg/kg
Zinc: 8990 to 44,600 mg/kg	
- The volume of waste rock associated with the site was estimated to be approximately 6,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 82 mg/kg	Mercury: 0.498 mg/kg
Manganese: 2780J mg/kg	Lead: 152 mg/kg
Antimony: 28 mg/kg	Zinc: 787 mg/kg
- There was one adit discharge observed at the site during the investigation. The MCL for arsenic was exceeded in the adit discharge, and the chronic aquatic life criteria for iron and zinc were exceeded. The acute aquatic life criteria for zinc was also exceeded in the adit discharge sample. No MCLs were exceeded in Flat Creek; however, the acute and chronic aquatic life criteria for zinc were exceeded in the downstream sample, which was directly attributed to the site.
- Flat Creek flowed southwest through the tailings to its confluence with the Clark Fork River approximately 3.5 miles downstream. An observed release to Flat Creek was documented for zinc. Additionally, significant increases in the concentrations of most metals were observed in the downstream Flat Creek sediments (when compared with the upstream sediment concentrations) which was directly attributed to the site. Observed releases to Hall Gulch (sediment) were documented for arsenic, cadmium, mercury, manganese, lead, antimony, and zinc.

**Iron Mountain Mill PA# 31-010**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 07/22/83**

**SOLID MATRIX ANALYSES**

Metals in soils Results per dry weight basis											
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	CYANIDE (mg/Kg)
31-010-SE-1	428	46.4	27.5	5.5	1.6 U	51.3	32100	7.46	1800 J	7	NR
31-010-SE-2	15	58.7	0.5 U	3.9	1.5 U	8.6	12400	0.014 U	312 J	6	NR
31-010-SE-3	231	191	3.3	24.1	3.8	25.5	20300	0.652	3950 J	65	NR
31-010-SE-4	18	49.1	0.5 U	6.9	1.7	12.6	9730	0.057	231 J	6	NR
31-010-TP-1	1470	5	210	2.8	5.4	319	36800	32.6	2080 J	3	NR
31-010-TP-2	2120	3.2	43.3	1.5 U	1 U	68	54000	6.66	2010 J	2 U	NR
31-010-WR-1	82	3.7	0.5 U	8.1	1.4 U	19.4	30600	0.498	2780 J	15	NR
BACKGROUN	13	257	0.5 U	8.5	2.7	15.5	17200	0.012 U	448 J	10	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE v/1000	NEUTRAL POTENT. v/1000	ACID BASE POTENT. v/1000	SULFUR %	SULFATE %	SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	SULFUR %	ACID BASE v/1000	ACID BASE POTENT. v/1000	ACID BASE POTENT. v/1000
31-010-TP-1	2.53	79	4.2	-75	0.52	0.52	0.48	15	1.53	6.25	15	6.25	-10.8	-10.8
31-010-TP-2	1.52	47.5	6.67	-41	0.7	0.7	0.2	0.42	0.62	0.94	0.2	0.94	0.42	0.42
31-010-WR-1	0.11	3.44	139	136	<0.01	<0.01	0.03	0.09	0.09	0.94	0.03	0.94	138	138

**WATER MATRIX ANALYSES**

**Metals in Water  
Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-010-GW-1	302	38.4 JX	2.57 U	9.7 U	6.83 U	2.7 J	1620 J	0.038 U	4850	30.2	1.9 J	30.7 U	3850 J	486
31-010-SW-1	5.53	40.7 JX	2.57 U	9.7 U	6.83 U	2.63 J	26.7 J	0.038 U	4.08 U	12.7 U	2.97 J	30.7 U	268 J	150
31-010-SW-2	3.63	40.2 JX	2.57 U	9.7 U	6.83 U	1.57 J	41.3 J	0.038 U	4.08 U	12.7 U	1.2 J	30.7 U	7.57 U	138

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry  
Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-010-GW-1	612	< 5.0	183	< 0.05	NR
31-010-SW-1	195	< 5.0	8	< 0.05	NR
31-010-SW-2	203	< 5.0	< 5.0	0.1	NR

**LEGEND**

- SE1 - Flat Creek below millsite.
- SE2 - Flat Creek above millsite.
- SE3 - Hall Gulch below waste rock dump 1.
- SE4 - Hall Gulch above waste rock dump 1.
- TP1 - Composite of subsamples TP1A1, 1A2, and 1B1.
- TP2 - Composite of subsamples TP2A through 2E.
- WR1 - Composite of subsamples WR1A through 1C.
- BACKGROUND - From the Dillon Millsite (31-073-SS-1).
- GW1 - Add discharge into Hall Gulch.
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Belle of the Hills</u>	County: <u>Mineral</u>
Legal Description: <u>T 17N R 26W</u>	Section(s): <u>SW 1/4, SW 1/4, Sec. 1</u>
Mining District: <u>Iron Mountain</u>	Mine Type: <u>Hardrock/Pb, Zn, Ag</u>
Latitude: <u>N 47° 15' 20"</u>	Primary Drainage: <u>Flat Creek</u>
Longitude: <u>W 114° 51' 20"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Hall Gulch</u>
Quad: <u>Quinns Hot Springs</u>	Date Investigated: <u>July 22, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>31-072</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 7,770 cubic yards. The following elements were elevated at least three times background:

Arsenic: 244 to 1230 mg/kg	Cadmium: 102 to 130 mg/kg
Copper: 62 to 243 mg/kg	Iron: 66,000 mg/kg
Mercury: 7.8 to 47.7 mg/kg	Manganese: 2330J to 5580J mg/kg
Lead: 10,700 to 40,300 mg/kg	Antimony: 785 to 3540 mg/kg
Zinc: 1230 to 14,100 mg/kg	
- There were no adit discharges, filled shafts, seeps, or springs observed at the site during the investigation; consequently, no groundwater or surface water samples were collected. Intermittent Hall Gulch, located approximately 400 feet below the site, appeared to be the nearest surface water drainage to the site.
- Four potentially hazardous mine openings, including three adits and one shaft, were observed at the site during the investigation.

Belle of the Hills PA# 31-072  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/22/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-072-WR-1	1230	16.3	102	2.8	1.2 U	243	33400	47.7	2330 J	3	40300	3540	1230	NR
31-072-WR-2	244	6.7	130	2.8	1 U	62	66000	7.8	5580 J	3	10700	785	14100	NR
BACKGROUND	13	257	0.5 U	8.5	2.7	15.5	17200	0.012 U	448 J	10	17	6 U	64	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR	ACID BASE	SULFUR	ACID BASE	POTENT.	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	SULFUR	ACID BASE	SULFUR	ACID BASE	SULFUR	ACID BASE	SULFUR	ACID BASE
	%	U/1000	%	U/1000	U/1000	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
31-072-WR-2	0.64	20			11.7	-8.3	0.14	-8.3			0.13	4.06	0.37	0.37	0.13	4.06	7.62	7.62
31-072-WR-1	0.23	7.19			13.4	6.23	0.17	6.23			0.02	0.62	0.04	0.04	0.02	0.62	12.8	12.8

LEGEND

WR1 - Composite of subsamples WR1, 2, and 3.  
WR2 - Composite of subsamples WR4A, 5A, 4B, and 5B.  
BACKGROUND - From the Dillon Millrite (31-073-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Dillon Millsite</u>	County: <u>Mineral</u>
Legal Description: <u>T 17N R 26W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 12</u>
Mining District: <u>Iron Mountain</u>	Mine Type: <u>Millsite/Unknown</u>
Latitude: <u>N 47° 15' 15"</u>	Primary Drainage: <u>Flat Creek</u>
Longitude: <u>W 114° 51' 30"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Hall Gulch</u>
Quad: <u>Plains</u>	Date Investigated: <u>July 22, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>31-073</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 3,000 cubic yards. Waste rock was observed in the intermittent Hall Gulch stream bed for approximately 1/4 mile downstream. The following elements were elevated at least three times background:

Arsenic: 863 mg/kg	Cadmium: 14 mg/kg
Copper: 67.9 mg/kg	Mercury: 1.43 mg/kg
Manganese: 4670J mg/kg	Lead: 3970 mg/kg
Antimony: 813 mg/kg	Zinc: 7710 mg/kg
- There were no adit discharges, filled shafts, seeps, or springs observed at the site during the investigation; consequently, no groundwater or surface water samples were collected.
- Observed releases to Hall Gulch (sediment) were documented for arsenic, cadmium, antimony, and zinc, and were directly attributed to the site.
- WR-1, which was cut by Hall Gulch, was extremely steep and potentially hazardous.

Dillon Millsite PA# 31-073  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/22/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-073-SE-1	41	190	0.7 U	6.1	2.9	17.2	24800	0.813	1040 J	8	395	9 U	275	NR
31-073-SE-2	396	38.3	6.5	8.4	1.5	22.4	22300	0.399	1480 J	19	498	45	3380	NR
31-073-WR-1	863	155	14	7.4	2.6	67.9	35300	1.43	4670 J	12	3970	813	7710	NR
BACKGROUND	13	257	0.5 U	8.5	2.7	15.5	17200	0.012 U	448 J	10	17	6 U	64	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL	NEUTRAL POTENTIAL	SULFUR ACID BASE POTENTIAL	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL	SULFUR ACID BASE POTENTIAL
31-073-WR-1	0.48	15	131	116	0.07	0.21	0.2	6.56	124

LEGEND

SE1 - Upstream in Hall Gulch.  
SE2 - Downstream in Hall Gulch.  
WR1 - Composite of subsamples WR1A through 1C.  
BACKGROUND - Northwest of site along road,  
From Dillon Millsite (31-073-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Nancy Lee Mine</u>	County: <u>Mineral</u>
Legal Description: <u>T 18N R 26W</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 31</u>
Mining District: <u>Keystone</u>	Mine Type: <u>Hardrock/Au, Pb, Zn</u>
Latitude: <u>N 47° 16' 12"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 57' 12"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Keystone Creek</u>
Quad: <u>Keystone Peak</u>	Date Investigated: <u>August 2, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>31-001</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation; however, tailings were observed in the stream bed approximately 3,000 feet downstream from the site.
- The volume of waste rock associated with this site was estimated to be approximately 30,875 cubic yards. The following elements were elevated at least three times background :

Arsenic: 143 to 445 mg/kg	Barium: 62.8 mg/kg
Copper: 55.4J to 161J mg/kg	Iron: 19,800 to 30,000 mg/kg
Mercury: 0.058J mg/kg	Manganese: 2050 to 2290 mg/kg
Nickel: 9.12 mg/kg	Lead: 266J to 340J mg/kg
Antimony: 27.1 to 46.2 mg/kg	Zinc: 184 to 324 mg/kg
- The water discharged from the adit associated with WR-4 exceeded the MCL and acute aquatic life criteria for arsenic and the chronic aquatic life criteria for arsenic and iron in samples collected near its mouth. After flowing through WR-4, the discharge exceeded the MCL for arsenic as well the chronic aquatic life criteria for arsenic and iron and the acute aquatic life criteria for iron.
- Two tunnels associated with the site, the Elander Tunnel and the Fawcett Tunnel, were fenced at the time of the investigation, but were open and potentially hazardous.

**Nancy Lee Mine PA# 31-001**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - TUESDAY**  
**INVESTIGATION DATE: 08/02/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-001-WR-1	445	4.95	0.5 U	2.55	1.41 U	60.3 J	27100	0.008 UJ	920	2.62 U	340 J	46.2	22.5	NR
31-001-WR-2	143	12	0.4 U	4.34	2.27	55.4 J	19800	0.015 J	2050	2.11 U	266 J	7.7	324	NR
31-001-WR-3	143	62.8	0.5 U	8.73	2.01	161 J	30000	0.059 J	2290	9.12	279 J	27.1	184	NR
BACKGROUND	7.89	8.8	0.5 U	3.31	1.2 U	2.44 J	3120	0.01 UJ	609	2.22 U	7.59 J	5.39 U	11.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	U/1000	POTENT.	U/1000	POTENT.	U/1000	%	SULFUR	%	SULFUR	%	SULFUR	ACID BASE	POTENT.	U/1000	U/1000
31-001-WR-1	0.28	8.75	0.90	0.90	-7.84	0.21	0.05	0.02	0.02	0.05	0.03	0.03	0.62	0.28	0.62	0.28
31-001-WR-2	0.55	1.56	4.97	4.97	3.41	0.01	0.03	0.01	0.01	0.03	0.03	0.03	0.31	4.66	0.31	4.66
31-001-WR-3																
31-001-WR-1DUP	0.29	9.06	1.15	1.15	-7.90	0.23	0.040	0.02	0.02	0.040	0.040	0.040	0.62	0.53	0.62	0.53

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-001-SW-1	815	40.5	2.57 U	9.7 U	8.2	1.55 U	33900	0.038 U	8160	15.3	1.55 U	30.7 U	7.57 U	530
31-001-SW-2	274	28	2.57 U	9.7 U	14.6	1.55 U	13200	0.038 U	7300	27	1.55 U	30.7 U	7.57 U	540

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-001-SW-1	694	16.0	213	< 0.05	NR
31-001-SW-2	684	5.7	214	< 0.05	NR

**LEGEND**

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
 WR2 - Composite of subsamples WR2A, 2B, and 3.  
 WR3 - Composite of subsamples WR4A, 4B, and 4C.  
 BACKGROUND - West of waste rock dump 1 on divide near road.

SW1 - Discharge from edit above waste rock dump 4.  
 SW2 - Discharge from edit which flows through waste rock dump 4, taken below dump.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Little Anaconda</u>	County: <u>Mineral</u>
Legal Description: T <u>18N</u> R <u>26W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 35</u>
Mining District: <u>Keystone</u>	Mine Type: <u>Hardrock/Au, Zn, Pb, Cu</u>
Latitude: <u>N 47° 16' 40"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 52' 35"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Pardee Creek</u>
Quad: <u>Plains</u>	Date Investigated: <u>July 23, 1993</u>
Inspectors: <u>Tuesday, Belanger, Clark</u>	P.A. # <u>31-077</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 9,230 cubic yards. The following elements were elevated at least three times background:

Arsenic: 39 mg/kg	Barium: 22.6J mg/kg
Cadmium: 3.6 mg/kg	Cobalt: 11.4J mg/kg
Copper: 15.4J mg/kg	Iron: 47,500 mg/kg
Mercury: 0.633J mg/kg	Manganese: 7,050 mg/kg
Nickel: 12J mg/kg	Lead: 2,720J mg/kg
- There was one adit discharge observed at the site during the investigation. The minor discharge flowed over WR-1 and combined with the drainage. No MCLs or acute or chronic aquatic life criteria were exceeded in the adit discharge sample.
- An unnamed intermittent tributary to Pardee Creek bisected the site directly through several of the waste rock dumps, the dumps were actively eroding into the drainage.

Little Anaconda PA# 31-077  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/23/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-077-WR-1	39	22.6 J	3.6	11.4 J	2.1	15.4 J	47500	0.633 J	7050	12 J	2720 J	15 J	301 J	NR
BACKGROUND	7.89	8.8	0.5 U	3.31	1.2 U	2.44 J	3120	0.01 UJ	609	2.22 U	7.59 J	5.39 U	11.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
31-077-WR-1	0.11	3.44	139	135	<0.01	0.04	0.1	1.25	137					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-077-GW-1	6.39	2.01 UX	2.57 U	9.7 U	9.2 J	1.9 J	55.9 J	0.038 U	11.3	12.7 U	7.43 J	30.7 U	60.7 J	261

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in r

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-077-GW-1	272	< 5.0	35	0.33	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
BACKGROUND - From the Nancy Lee Mine (31-001-SS-1).

GW1 - Discharge from lower acid.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Nancy Lee Millsite</u>	County: <u>Mineral</u>
Legal Description: <u>T 17N R 26W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 5</u>
Mining District: <u>Keystone</u>	Mine Type: <u>Millsite/Cu, Ag, Pb, Zn, Au</u>
Latitude: <u>N 47° 15' 55"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 56' 21"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Keystone Creek</u>
Quad: <u>Keystone Peak</u>	Date Investigated: <u>August 2, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>31-082</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 16,333 cubic yards. The tailings were observed in the floodplain of an unnamed drainage for approximately one mile downstream to confluence with Keystone Creek; however, the tailings were not observed in the Keystone Creek drainage. The following elements were elevated at least three times background:

Arsenic: 540 mg/kg	Barium: 27.6 mg/kg
Cadmium: 14.4 mg/kg	Cobalt: 15.9 mg/kg
Copper: 4630J mg/kg	Iron: 66,800 mg/kg
Mercury: 1.19J mg/kg	Manganese: 5340 mg/kg
Lead: 10,500J mg/kg	Antimony: 1230 mg/kg
Zinc: 9350 mg/kg	
- The flow in the unnamed drainage which travelled directly through the site consisted of the adit discharge originating at the Nancy Lee Mine located upstream. The MCL for arsenic and the chronic aquatic life criteria for arsenic and iron were exceeded in the upstream sample of this discharge; however, only the chronic aquatic life criteria for lead was exceeded in the downstream sample, just prior to where the water seeped into the ground. The chronic aquatic life criteria exceedance for lead was directly attributable to the site.
- Observed releases to surface water were documented for copper, lead, and zinc which were directly attributable to the site.

Nancy Lee Millsite PA# 31-082  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-082-TP-1	540	27.6	14.4	15.9	2.58	4630 J	66800	1.19 J	5340	2.38 U	10500 J	1230	9350	NR
BACKGROUND	7.89	8.8	0.5 U	3.31	1.2 U	2.44 J	3120	0.01 UJ	609	2.22 U	7.59 J	5.39 U	11.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		SULFUR	
	SULFUR	ACID BASE	ACID BASE	POTENT.	SULFUR	ACID BASE	SULFUR	POTENT.	ACID BASE	POTENT.
	%	1/1000	1/1000	%	%	1/1000	%	1/1000	1/1000	1/1000
31-082-TP-1	0.69	21.6	5.80	-15.8	0.06	0.70	1.87	2.98		

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-082-SW-1	4.84	43.1	2.57 U	9.7 U	6.83 U	15.7	34.8	0.054 J	8.2	12.7 U	18.7	30.7 U	53.2	314
31-001-SW-2	274	28	2.57 U	9.8 U	14.6	1.55 U	13200	0.038 U	7300	27	1.55 U	30.7 U	7.57 U	540

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-082-SW-1	404	5.7	120	< 0.05	NR
31-001-SW-2	684	5.7	214	< 0.05	NR

LEGEND

TP1 - Composite of subsamples TP1A, 1BA through 1BC, 1C, and 1D.  
BACKGROUND - From the Nancy Lee Mine (31-001-SW-1).  
SW1 - Middle of floodplain tailings just before water goes into ground.  
31-001-SW-2 - Upstream sample for this site from the Nancy Lee Mine.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Nancy Lee Millsite-Slowey</u>	County: <u>Mineral</u>
Legal Description: T <u>17N</u> R <u>27W</u>	Section(s): <u>NW 1/4, Sec. 14</u>
Mining District: <u>Keystone</u>	Mine Type: <u>Millsite/Au, Ag, Pb, Cu</u>
Latitude: <u>N 47° 14' 19"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 115° 00' 25"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Slowey Gulch</u>
Quad: <u>Wilson Gulch</u>	Date Investigated: <u>September 7, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>31-090</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 205,000 cubic yards of tailings on site. The following elements were elevated at least three times background:

Arsenic: 1,490J to 3,040J mg/kg	Cadmium: 9.3 to 14 mg/kg
Cobalt: 24.9 to 26.9 mg/kg	Chromium: 6.48 mg/kg
Copper: 299 to 316 mg/kg	Iron: 114,000 to 178,000 mg/kg
Mercury: 0.085J to 1.06J mg/kg	Manganese: 7,630 to 9,940 mg/kg
Lead: 1,080 to 2,320 mg/kg	Antimony: 85.4J to 123J mg/kg
Zinc: 2,180 to 3,440 mg/kg	
- There was no waste rock on site.
- There was no surface water on site; no surface water samples were collected. The nearest surface water was the Clark Fork River, approximately 200 feet away. A dry drainage existed on site. Observed releases of arsenic, cadmium, cobalt, mercury, lead, antimony, and zinc were documented in downstream sediments, but no direct pathway to the Clark Fork River was identified.
- There were no hazardous openings on site. There were four potentially hazardous structures identified on site.

Nancy Lee-Slowey PA# 31-090  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-090-SE-1	1010 J	379	13.8	15.8	4.8	435	30400	2.38 J	1620	7.21	3360	78.6 J	4240 J	NR
31-090-SE-2	31.4 J	93.6	0.4 U	3.66	4.11	590	14100	0.028 U	906	6.03	35.4	5.13 UJ	69.9 J	NR
31-090-TP-1	1490 J	6.21	9.3	24.9	2.9	316	178000	0.086 J	9940	1.99 U	1080	85.4 J	2180 J	NR
31-090-TP-2	3040 J	22.3	14.0	26.9	6.48	299	114000	1.06 J	7630	2.36	2320	123 J	3440 J	NR
BACKGROUND	7.89	8.8	0.5 U	3.31	1.2 U	2.44 J	3120	0.01 UJ	609	2.22 U	7.59 J	5.39 U	11.9	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE %	SULFUR ACID BASE POTENT. %
31-090-TP-1	0.66	20.6	9.15	-12	<0.01	0.74	0.19	23.1	-14
31-090-TP-2	0.78	24.4	9.07	-15	0.04	0.56	0.18	17.5	-8.42

LEGEND

SE1 - Intermittent drainage between tailings and cabin.  
SE2 - Upgradient intermittent drainage.  
TP1 - Composite of subsamples TP1A, 1B, 1C, 2A, 2B, 3A, 3B, and 3C  
TP2 - Composite of subsamples TP1D, 2C, 3C, and 4C.  
BACKGROUND - From the Nancy Lee (31-001-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Tarbox-Mineral King</u>	County: <u>Mineral</u>
Legal Description: <u>T 20N R 31W</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 35</u>
Mining District: <u>Packer Creek</u>	Mine Type: <u>Hardrock/Pb, Zn, Ag, Au</u>
Latitude: <u>N 47° 27' 05"</u>	Primary Drainage: <u>St. Regis River</u>
Longitude: <u>W 115° 29' 55"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Packer Creek</u>
Quad: <u>Haugan</u>	Date Investigated: <u>August 2, 1993</u>
Inspectors: <u>Bullock, Flammanq, Clark</u>	P.A. # <u>31-003</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 5300 cubic yards. The following elements were elevated at least three times background:

Arsenic: 244 to 4030 mg/kg	Cadmium: 45.8 mg/kg
Copper: 209J mg/kg	Iron: 142,000 mg/kg
Manganese: 6570 mg/kg	Lead: 158J to 10,100J mg/kg
Antimony: 279 mg/kg	Zinc: 443 to 26,400 mg/kg
- There was one adit discharge associated with this site. The small flow of approximately five gpm seeps from the adit portal through rock, discharging at the base of the dump. At this discharge point, the pH is 6.39 and the specific conductance was 140 umhos/cm. The MCLs/MCLGs were not exceeded in this discharge. The acute aquatic life criteria for zinc was exceeded and the chronic aquatic life criteria for lead and zinc were exceeded. The discharge flowed through a small wetlands prior to discharge into a tributary to Packer Creek.
- The Packer Creek tributary flowed north to south through the site, bisecting the waste rock dumps associated with the adit and shaft. Observed releases were documented for iron, manganese, and zinc. No MCL/MCLGs were exceeded in the stream. The acute and chronic aquatic life criteria for zinc were exceeded and directly attributable to this site.
- The headframe of the shaft was a hazardous structure. The shaft was covered at the time of this investigation, but was accessible and potentially hazardous.

Tarbox-Mineral King PA# 31-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-003-SE-1	1210	45.1	1.7	5.61	2.9	42.6 J	87000	0.009 UJ	9650	2.1 U	3060 J	5.08 U	2440	NR
31-003-SE-2	17.3	31.9	0.6 U	3.43	1.47 U	8.12 J	21800	0.009 UJ	711	7.99	37.9 J	6.61 U	55.4	NR
31-003-WR-1	4030	33.4	45.8	6.57	3.34	209 J	142000	0.308 J	6570	2.59 U	10100 J	279	26400	NR
31-003-WR-2	244	26.9	1.1	6.53	2.55	18 J	18700	0.071 J	1180	8.63	158 J	4.16 U	443	NR
BACKGROUND	4.52 U	241 J	0.5 U	6.09 J	4.83	16.2 J	12500	0.047 J	1020 J	9.02	22.2 J	5.89 U	59.3 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT. 1/1000
31-003-WR-1	3.14	98.1	3.19	94.9	0.01	0.83	2.30	25.9	0.038 U	793	13.5	1.97	0.038 U	793	13.5	-22.7
31-003-WR-2	0.14	4.37	14.2	9.82	0.01	0.04	0.09	1.25	0.039 J	178	14.4	2.85	0.039 J	178	14.4	12.9

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-003-GW-1	1.69 U	16.2	2.57 U	9.7 U	6.83 U	1.55 U	594	0.038 U	793	13.5	1.97	30.7 U	307	57.5
31-003-SW-1	3.46	8.9	2.57 U	9.7 U	6.83 U	1.55 U	378	0.039 J	178	14.4	2.85	30.7 U	256	27.2
31-003-SW-2	1.69 U	6.37	2.57 U	9.7 U	6.83 U	1.55 U	53.4	0.049 J	5.6	12.7 U	1.86	30.7 U	7.57 U	11.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-003-GW-1	99	< 5.0	22	< 0.05	NR
31-003-SW-1	55	5.7	8	< 0.05	NR
31-003-SW-2	43	5.7	5	< 0.05	NR

LEGEND

- SE1 - Downgradient of waste rock dump 1, approx. 30' below lower shaft dump.  
SE2 - Upgradient of waste rock dump 2 on South Fork of Creek.  
WR1 - Sample of the WR1A subsample.  
WR2 - Composite of subsamples WR1B, 1C, 2A, 2B, and 2C.  
BACKGROUND - From the Saltese Consolidate (31-021-SS-1).
- GW1 - At seep below adit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Saltese Consolidate</u>	County: <u>Mineral</u>
Legal Description: T <u>19N</u> R <u>30W</u>	Section(s): <u>SE 1/4, NW 1/4, Sec. 4</u>
Mining District: <u>Packer Creek</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 47° 26' 10"</u>	Primary Drainage: <u>St. Regis River</u>
Longitude: <u>W 115° 25' 40"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Timber Creek</u>
Quad: <u>Haugan</u>	Date Investigated: <u>August 2, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>31-021</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 1,300 cubic yards. The following elements were elevated at least three times background:  
Mercury: 0.228J mg/kg
- One discharging adit was observed at the site during the investigation. No MCLs were exceeded in the adit discharge; however, chronic aquatic life criteria were exceeded for mercury and lead. The adit discharge was sampled farther downstream after flowing over the waste rock dump, the sample exceeded the chronic aquatic life criteria for mercury.
- A potentially hazardous highwall was identified behind Adit #1, and a cabin located east of the site was collapsing and potentially hazardous.

**Salteste Consolidate PA# 31-021**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/02/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
31-021-WR-1	4.17 U	41	0.5 U	2.2	1.31	12.8 J	5740	0.228 J	255	4.27	29.7 J	5.42 U	39.3	NR
BACKGROUND	4.52 U	241	0.5 U	6.09	4.83	16.2 J	12500	0.047 J	1020	9.02	22.2 J	5.89 U	59.3	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR ACID BASE POTENT.		ORGANIC SULFUR %		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
31-021-WR-1	<0.01	0.00	3.14	3.14	<0.01	3.14	<0.01	0.00	<0.01	0.00	<0.01	3.14

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
31-021-GW-1	1.69 U	2.83	2.57 U	9.7 U	7.2	1.55 U	18.6	0.052 J	4.08 U	12.7 U	3.07	30.7 U	7.57 U	23
31-021-SW-1	1.69 U	16.5	2.57 U	9.7 U	6.83 U	1.55 U	65	0.056 J	11.2	12.7 U	1.55 U	30.7 U	7.57 U	21.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
31-021-GW-1	48	6.2	< 5.0	< 0.05	NR
31-021-SW-1	58	5.2	< 5.0	< 0.05	NR

**LEGEND**

WR1 - Composite of subsamples WR1A, 1B, and 2.  
 BACKGROUND - From the Salteste Consolidate Mine (31-021-SS-1).

GW1 - Approx. 10' from the mouth of adit #1 where it appears out of a vegetated area.  
 SW1 - Approx. 50' below lower adit - downgradient.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Wallace Creek Millsite  
Legal Description: T 12N R 17W  
Mining District: Clinton  
Latitude: N 46° 47' 44"  
Longitude: W 113° 40' 27"  
Land Status: Private  
Quad: Clinton  
Inspectors: Bisch, Flammang, Clark, West  
Organization: Pioneer Technical Services, Inc.

County: Missoula  
Section(s): SW 1/4, SE 1/4, Section 24  
Mine Type: Millsite/Au, Ag, Cu, Pb  
Primary Drainage: Clark Fork River  
USGS Code: 17010201  
Secondary Drainage: Wallace Creek  
Date Investigated: June 30, 1994  
P.A. # 32-019

- The volume of tailings observed at the site was estimated to be 10,020 cubic yards. The following elements were elevated to at least three times the background concentrations (cyanide was detected in the tailings at 0.281 mg/kg):

Arsenic: 67.5J to 118J mg/kg	Lead: 322 to 544 mg/kg
Barium: 300 mg/kg	Antimony: 12.8 mg/kg
Cadmium: 1.8J mg/kg	Zinc: 242J to 442J m/kg
Mercury: 1.05 to 4.52 mg/kg	
- No waste rock was observed at the site.
- There were no discharging adits or filled shafts observed at the site. A spring that emanated near the mill complex was sampled. No MCLs or acute or chronic aquatic life criteria were exceeded. Another spring located approximately 800 feet downstream from the site was piped to a residence and used as a drinking water source. Using the spring located near the mill complex as the upgradient sample, and the drinking water spring as the downgradient sample, observed releases to groundwater were documented for zinc and cyanide; however, no MCLs were exceeded in the drinking water spring.
- Intermittent Wallace Creek flows adjacent to the site on the north side. Water was flowing in Wallace Creek for a short distance downstream from the site; however, no water was present in the drainage upstream from the site. No observed releases to Wallace Creek were documented, and no MCLs or aquatic life criteria were exceeded.
- Potential safety hazards observed at the site included the collapsing mill building and various scattered debris.

Wallace Creek Millsite PA# 32-019  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 06/30/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-019-SE1	1.6 JX	6.9 UJ	256	0.7 UJ	2.3 U	5.3 J	52.9 J	5040	0.09	168 J	20.7 JX	17.8	7.7 U	54.9 J	NR
32-019-SE2	0.5 UJX	6.0 J	314	1.6 J	8.6 J	12.0 J	49.5 J	10500	0.08	628 J	9.6 JX	31.2	4.9 U	31.7 J	NR
32-019-TP1	3.6 JX	67.5 J	276	0.5 J	1.4 U	6.0 J	34.5 J	9590	1.05	695 J	2.6 JX	322	4.9 U	242 J	0.281
32-019-TP2	11.8 JX	118 J	300	1.8 J	2.9 J	12.9 J	52.7 J	14000	4.52	988 J	14.6 JX	544	12.8	442 J	<0.222
BACKGROUND	NR	17 JX	95	0.5 U	1.9 J	5.4 J	17.6	8760 J	0.081	747	9 J	63 J	4 U	57 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000r	NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
32-019-TP1	0.09	2.81	437	434	<0.01	0.13	0.15	4.06	433
32-019-TP2	0.06	1.87	383	382	<0.01	0.14	0.03	4.37	379

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-019-GW1	0.12 U	1.3 UX	301	2.6 U	8.7 U	4.7 U	21.3	30.0	0.11 U	4.4 U	8.0 U	1.2	29.4 U	930 J	81.8
32-019-SW1	0.12 U	1.3 UX	295	2.6 U	8.7 U	4.7 U	4.6 U	11.1	0.11 U	4.4 U	8.0 U	1.1 U	29.4 U	5.0 J	92.9
32-019-SW3	0.12 U	1.3 UX	252	2.6 U	8.7 U	4.7 U	4.6 U	9.4 U	0.11 U	4.4 U	9.4	1.1 U	29.4 U	4.5 U	74.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-019-GW1	90	<5.0	7.0	0.09	0.01
32-019-SW1	124	<5.0	7.0	0.07	<0.005
32-019-SW3	86	<5.0	8.0	0.07	<0.005

LEGEND

- SE1 - Derivation from the site in Wallace Creek.  
SE2 - Upstream in Wallace Creek under present flow (see notes).  
TP1 - Composite of subsamples TP1A-A through 1A-C and 1B-A through 1B-B.  
TP2 - Composite of subsamples TP2A and 2B.  
BACKGROUND - From the Linton Mine (32-017-SE3) (1993 Data).
- GW1 - Residential spring from JB Welding and residence located 800' downstream of site used as a drinking water source.  
SW1 - Same as sample 32-019-SE1.  
SW3 - Spring 80' north of the building.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Copper Cliff</u>	County: <u>Missoula</u>
Legal Description: T <u>12N</u> R <u>15W</u>	Section(s): <u>NW 1/4, SW 1/4, Section 11</u>
Mining District: <u>Copper Cliff</u>	Mine Type: <u>Hardrock/Cu, Ag, Au</u>
Latitude: <u>N 46° 48' 0.0"</u>	Primary Drainage: <u>Union Creek</u>
Longitude: <u>W 113° 27' 14.7"</u>	USGS Code: <u>17010203</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Union Creek</u>
Quad: <u>Union Peak</u>	Date Investigated: <u>June 28, 1994</u>
Inspectors: <u>Bisch, Flammang, Clark, West</u>	P.A. # <u>32-001</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 3,490 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 175J to 2,590J mg/kg	Mercury: 0.40 mg/kg
Chromium: 61.0J mg/kg	Nickel: 40.1JX mg/kg
Copper: 462J to 5,200J mg/kg	Lead: 48.4 to 167 mg/kg
Iron: 79,900 mg/kg	
- An intermittent drainage (dry during the investigation) meandered through the site before merging with Union Creek. Observed releases to the intermittent drainage (sediment) were documented for arsenic, copper, mercury, and lead.
- Potential safety hazards observed at the site included an unstable metal loadout structure and scattered wooden and metal debris in the area of the collapsed shaft.

Copper Cliff PA# 32-001  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 06/28/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-001-SE1	0.6 UUX	135 J	103	0.5 UJ	10.6 J	12.9 J	1140 J	21000	0.22	206 J	27.0 JX	50.9	5.8 U	76.0 J	NR
32-001-SE2	0.4 UUX	17.4 J	225	0.6 J	10.5 J	12.9 J	49.5 J	24000	0.04	482 J	19.7 JX	16.1	4.6 U	46.9 J	NR
32-001-WR1	0.6 JX	250 J	74.3	0.5 UJ	1.8 U	6.29 J	548 J	14800	0.09	67.4 J	4.3 JX	187	8.4	11.6 J	NR
32-001-WR3	0.6 UUX	175 J	303	0.6 UJ	3.2 J	34.7 J	462 J	79900	0.09	59.3 J	21.9 JX	130	6.7 U	61.9 J	NR
32-001-WR4	0.6 UUX	2590 J	90.5	0.6 UJ	10.3 J	61.0 J	5200 J	45000	0.40	102 J	40.1 JX	48.4	6.7 U	36.2 J	NR
BACKGROUND	0.4 UUX	3.9 UJ	219	0.4 UJ	6.5 J	14.4 J	12.4 J	18900	0.04	442 J	9.4 JX	8.6	4.4 U	33.5 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE V/1000	NEUTRAL POTENT V/1000	SULFUR ACID BASE POTENT V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE V/1000	SULFUR ACID BASE POTENT V/1000
32-001-WR1	1.09	34.1	-0.55	-35	<0.01	0.02	1.16	0.62	-1.17
32-001-WR3	0.25	7.81	-8.16	-16.0	0.14	0.02	0.09	0.62	-8.78
32-001-WR4	0.99	30.9	-3.43	-34	0.77	0.07	0.15	2.19	-5.81

LEGEND

SE1 - Approximately 50% decomposition of WR1.  
SE2 - Upstream of site just before confluence with a dry drainage from the east.  
WR1 - Composite of subsamples WR1A and 1B.  
WR3 - Composite of subsamples WR 3A and 3B.  
WR4 - Grab sample of the WR4 subsample.  
BACKGROUND - From the Copper Cliff Mine (32-001-SS1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Frogs Diner</u>	County: <u>Missoula</u>
Legal Description: T <u>12N</u> R <u>15W</u>	Section(s): <u>SE 1/4, NW 1/4, Section 11</u>
Mining District: <u>Copper Cliff</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 48' 44"</u>	Primary Drainage: <u>Union Creek</u>
Longitude: <u>W 113° 27' 00"</u>	USGS Code: <u>17010203</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Union Creek</u>
Quad: <u>Union Peak</u>	Date Investigated: <u>June 28, 1994</u>
Inspectors: <u>Bisch, Flammang, Clark, West</u>	P.A. # <u>32-027</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site.
- The volume of waste rock observed at the site was estimated to be 315 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 129J mg/kg	Mercury: 0.70 mg/kg
Cobalt: 37.0J mg/kg	Nickel: 36.1JX mg/kg
Copper: 203J mg/kg	Lead: 34.7 mg/kg
Iron: 59,300 mg/kg	
- One discharging adit was observed at the site. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for iron was exceeded.
- Union Creek flows through the center of the site. An observed release to Union Creek was documented for iron; however, no MCLs or acute or chronic aquatic life criteria were exceeded in the stream.

Frogs Diner PA# 32-027  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BISCH  
INVESTIGATION DATE: 06/28/94

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-027-SE1	1.4 JX	53.3 J	166	0.5 UJ	15.8 J	22.2 J	203 J	24300	0.04	365 J	33.9 JX	24.1	5.2 U	63.3 J	NR
32-027-SE2	2.0 JX	74.4 J	167	0.5 UJ	38.1 J	17.7 J	281 J	18900	0.03	416 J	38.4 JX	22.7	7.1	62.9 J	NR
32-027-WR1	0.5 UJX	129 J	138	0.5 UJ	37.0 J	6.2 J	203 J	59300	0.70	556 J	36.1 JX	34.7	5.5 U	66.0 J	NR
BACKGROUND	0.4 UJX	3.9 UJ	219	0.4 UJ	6.5	14.4 J	12.4 J	18900	0.04	442 J	9.4 JX	8.6	4.4 U	33.5 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR V/1000	ACID BASE V/1000	NEUTRAL POTENT V/1000	SULFUR ACID BASE POTENT V/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-027-WR1	0.84	26.2	-2.92	-29	0.17	0.08	0.59	2.50	-5.42								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-027-GW1	0.12 U	20.2 JX	12.4	2.6 U	12.2	4.7 U	12.5	14200	0.11 U	273	25.3	1.1 U	29.4 U	21.3 J	136
32-027-SW1	0.12 U	3.2 JX	97.3	2.6 U	8.7 U	4.7 U	6.8	472	0.11 U	132	12.4	1.1 U	29.4 U	5.6 J	138
32-027-SW2	0.12 U	1.3 UX	98.6	2.6 U	8.7 U	4.7 U	5.9	94.8	0.11 U	6.13	8.0 U	1.1 U	29.4 U	4.5 U	135

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-027-GW1	171	<5.0	89	<0.05	NR
32-027-SW1	155	<5.0	17	0.05	NR
32-027-SW2	155	<5.0	14	0.07	NR

LEGEND

SE1 - 75' downcast in Union Creek from confluence with old discharge.  
SE2 - 50' upstream in Union Creek from road crossing.  
WR1 - Composite of subsamples WR1A and 1B.  
BACKGROUND - From the Copper Creek Mine (32-001-SE1).  
GW1 - Aft #1 discharge.  
SW1 - Same as sample 32-027-SE1.  
SW2 - Same as sample 32-027-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Linton Mine and Millsite</u>	County: <u>Missoula</u>
Legal Description: <u>T 12N R 15W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 30</u>
Mining District: <u>Unincorporated</u>	Mine Type: <u>Hardrock/Pb, Ag</u>
Latitude: <u>N 46° 46' 30"</u>	Primary Drainage: <u>Cramer Creek</u>
Longitude: <u>W 113° 32' 36"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Cramer Creek</u>
Quad: <u>Mineral Ridge</u>	Date Investigated: <u>July 1, 1993</u>
Inspectors: <u>Bullock, Flammanq, Clark</u>	P.A. # <u>32-017</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 23,000 cubic yards. The tailings were severely eroded by Cramer Creek. The following elements were elevated at least three times background:

Arsenic: 1090JX mg/kg	Manganese: 34,300 mg/kg
Barium: 7340 mg/kg	Nickel: 151J mg/kg
Cobalt: 43.1J mg/kg	Lead: 210J mg/kg
Copper: 105 mg/kg	Mercury: 1.41 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 6,500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 136 mg/kg	Manganese: 3,620J mg/kg
Barium: 694JX mg/kg	Lead: 4,890J to 14,100 mg/kg
Copper: 155 to 183JX mg/kg	Antimony: 28J to 34 mg/kg
Mercury: 7.88 mg/kg	
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Cramer Creek was flowing east to west adjacent to the site on the south side. The tailings and one of the waste rock dumps (WR-4) were situated next to the creek and tailings were actively eroding into the stream. There was not an observed release to surface water documented in the water samples. No MCL/MCLGs or acute or chronic aquatic life criteria were exceeded in upstream or downstream surface water samples. Observed releases of arsenic, barium, cobalt, copper, mercury, manganese, and lead were documented in the stream sediment samples.
- Six potentially hazardous mine openings were identified at the site. The loadout structure located in the east-central section of the site was also potentially hazardous and the southern part of the tailings pile was severely undercut by Cramer Creek.

**Linton PA# 32-017**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 07/01/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-017-SE-1	168 J	2420 JX	0.5 U	14.8 JX	4.1	57.2 JX	6220	0.552 J	11400 J	15	5830	21	60 J	NR
32-017-SE-2	6 U	87.7 JX	0.6 U	2.5 UJX	6.6	10.4 JX	8010	0.16 J	410 J	9	88	8 U	65 J	NR
32-017-TP-1	1090 JX	7340	0.6 U	43.1 J	13.1 J	105	25900 J	1.41	34300 J	151 J	210 J	9 J	85 J	NR
32-017-WR-1	30 JX	12.2	0.5 U	1.1 U	2.2 J	155	3970 J	7.88	711 J	6 J	4890 J	28 J	56 J	NR
32-017-WR-4	136 J	694 JX	0.5 U	3.1 JX	1.7	183 JX	4690	0.04 J	3620 J	7	14100	34	36 J	NR
BACKGROUND	17 JX	95	0.5 U	1.9 J	5.4 J	17.6	8760 J	0.081	747 J	9 J	63 J	4 U	57 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	POTENT. 1/1000
32-017-TP-1	<0.01	0	309	309	<0.01	0.01	<0.01	0	<0.01	0	<0.01	0	<0.01	0	309	309
32-017-WR-1	0.01	0.31	960	960	0.01	<0.01	<0.01	0	<0.01	0	<0.01	0	<0.01	0	960	960
32-017-WR-4	0.03	0.94	912	911	0.03	<0.01	<0.01	0	<0.01	0	<0.01	0	<0.01	0	912	912

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-017-SW-1	5.11 J	50 JX	2.57 U	9.7 U	6.83 U	1.55 U	66.4	0.038 U	4.9	12.7 U	1.25	30.7 U	7.57 U	213
32-017-SW-2	5.13 J	52.1 JX	2.57 U	9.7 U	6.83 U	1.55 U	51.6	0.038 U	4.08 U	12.7 U	1 U	30.7 U	7.57 U	214

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-017-SW-1	237	6.7	10	0.11	NR
32-017-SW-2	242	6.7	8	0.13	NR

**LEGEND**

- SE1 - Downstream Cramer Creek.  
 SE2 - Upstream Cramer Creek.  
 TP1 - Composite of subsamples TP1A-A, 1A-B, and 1B-A.  
 WR1 - Composite of subsamples WR1A, 1B, 1C, 2A, 2B, and 2C.  
 WR4 - Sample of the WR4 subsample.  
 BACKGROUND - From the Linton Mine (32-017-SS-1).
- SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Morse and Kennedy</u>	County: <u>Missoula</u>
Legal Description: T <u>13N</u> R <u>14W</u>	Section(s): <u>N 1/2, Sec. 15</u>
Mining District: <u>Elk Creek</u>	Mine Type: <u>Hardrock/Cu</u>
Latitude: <u>N 46° 23' 20"</u>	Primary Drainage: <u>Elk Creek</u>
Longitude: <u>W 113° 21' 20"</u>	USGS Code: <u>17010203</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>North Fork of Elk Creek</u>
Quad: <u>Bata Mountain</u>	Date Investigated: <u>July 1, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>32-033</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 65,700 cubic yards of uncovered waste rock at the site. The following were elevated at least 3 times background:  
Barium: 3,810JX mg/kg  
Mercury: 1.08J mg/kg  
Lead: 111 mg/kg
- There were no discharging adits at the site.
- There was no surface water on the site. The nearest surface water was 0.5 mile away.
- There were no hazardous openings at the site; but, there were highwalls associated with the pits.

Morse & Kennedy PA# 32-033  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/01/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-033-WR-1	4 U	3810 JX	0.4 U	5.4 JX	18.5	10.8 JX	10400	0.051 J	290 J	11	7 U	6	11 J	NR
32-033-WR-2	12 J	166 JX	0.5 U	6 JX	5.6	29.6 JX	9160	1.08 J	815 J	11	111	13	64 J	NR
BACKGROUND	5 U	322 JX	0.6 U	5.6 JX	10	10.4 JX	9450	0.071 J	640 J	8	9 U	7 U	30 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
32-033-WR-1	<0.01	0	29.7	29.7	<0.01	<0.01	<0.01	0	29.7
32-033-WR-2	<0.01	0	506	506	<0.01	<0.01	0.01	0	506

LEGEND

WR1 - Composite of subsamples WR1, 2, 3, and 4.

WR2 - Composite of subsamples WRS5A and 5B.

BACKGROUND - From Morse and Kennedy Mine (32-033-SS-1)

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Joe Wallit Mine</u>	County: <u>Missoula</u>
Legal Description: T <u>17N</u> R <u>24W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 8</u>
Mining District: <u>Nine Mile</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 47° 15' 11"</u>	Primary Drainage: <u>Nine Mile Creek</u>
Longitude: <u>W 114° 41' 11"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>St. Louis Creek</u>
Quad: <u>Knowles</u>	Date Investigated: <u>July 2, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>32-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 68,300 cubic yards of uncovered waste rock on site. The following were elevated at least 3 times background:  
Arsenic: 31J mg/kg  
Copper: 338JX mg/kg
- There were no discharging adits at the site.
- The East Fork of St. Louis Creek flows through the waste rock dumps and St. Louis Creek flows adjacent to the waste rock dumps. There were observed releases of arsenic and copper in downstream sediment; there were no observed releases to downstream surface water. No MCL/MCLGs were exceeded, but the chronic fresh water aquatic life criteria for lead was exceeded in downstream surface water.
- There were no hazardous openings at the site, but there was a highwall at the pit.

Joe Wallit PA# 32-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 07/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-010-SE-1	10 J	44.7 JX	0.5 U	5.3 JX	3.5	11.4 JX	15300	0.066 J	251 J	14	12	6	64 J	NR
32-010-SE-2	32 J	49.5 JX	0.5 U	7.5 JX	2.1	739 JX	18100	0.062 J	1000 J	9	20	12	74 J	NR
32-010-WR-1	31 J	64.6 JX	0.5 U	6.7 JX	2.3	338 JX	16000	0.137 J	807 J	9	98	13	136 J	NR
BACKGROUND	8 J	336 JX	0.9	5.9 JX	2.2 U	12.1 JX	8140	0.18 J	1730 J	8	41	10 U	57 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		56
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	
32-010-WR-1	0.01	0.31	56.7	56.3	<0.01	0.02	<0.01	0.62	<0.01	0.02	0.62	<0.01	0.02	0.62	56

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-010-SW-1	3.65 J	4.8 JX	2.57 U	9.7 U	6.83 U	1.55 U	12.3	0.120	4.08 U	12.7 U	1.5	30.7 U	12.9	37.8
32-010-SW-2	3.7 J	2.01 UJX	2.57 U	9.7 U	8.83	1.55 U	19.7	0.160	4.08 U	12.7 U	3.43	30.7 U	7.57 U	16.1
32-010-SW-3	3.82 J	3.17 JX	2.57 U	9.7 U	6.83 U	1.7 J	54	0.200	23.1	12.7 U	1 U	30.7 U	7.57 U	30.7
32-010-SW-4	3.01 J	2.3 JX	2.57 U	9.7 U	6.83 U	15 J	39.3	0.190	4.4	12.7 U	2.88	30.7 U	7.57 U	19.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-010-SW-1	77	< 5.0	< 5	< 0.05	NR
32-010-SW-2	56	< 5.0	< 5	< 0.05	NR
32-010-SW-3	61	< 5.0	< 5	< 0.05	NR
32-010-SW-4	59	6.7	< 5	< 0.05	NR

LEGEND

SE1 - Upgradient in St. Louis Creek.  
SE2 - Below confluence of East Fork St. Louis Creek in St. Louis Creek.  
WR1 - Composite of subsamples WR1, 2, 3, and 4.  
BACKGROUND - From the Joe Wallit Mine (32-010-SS-1).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Downgradient of last dump in St. Louis Creek.  
SW4 - Upgradient in East Fork of St. Louis Creek.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lost Cabin Mine</u>	County: <u>Missoula</u>
Legal Description: <u>T 16N R 22W</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 13</u>
Mining District: <u>Nine Mile</u>	Mine Type: <u>Hardrock/Zn, Pb, Cu, Ag, Au</u>
Latitude: <u>N 47° 08' 56"</u>	Primary Drainage: <u>Kennedy Creek</u>
Longitude: <u>W 114° 26' 40"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Kennedy Creek</u>
Quad: <u>McCormick Peak</u>	Date Investigated: <u>July 2, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>32-011</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- This site was in close proximity to the Hautilla Mine (PA# 32-057) and the Nugget Mine (PA# 32-042).
- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 3700 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 98J mg/kg                      Copper: 1150JX mg/kg  
Mercury: 0.318J mg/kg                  Lead: 3370 mg/kg
- The waste rock dump was mostly unvegetated.
- No discharging adits, seeps and springs were found at the site.
- Surface water samples were collected upstream and downstream of the site in Kennedy Creek which bisected the site. There were no observed releases documented to surface water and the samples did not exceed MCL/MCLGs. Acute and chronic aquatic life criteria for copper were exceeded and attributable to this site. Stream sediment samples did document observed releases of copper, mercury, and lead, attributable to this site.
- The bridge on Kennedy Creek at the site posed a potential hazard to site visitors.

Lost Cabin PA# 32-011  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/02/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-011-SE-1	26 J	43.6 JX	0.6 U	10.1 JX	5.4	177 JX	24300	0.199 J	548 J	16	346	7 U	293 J	NR
32-057-SE-1	11 J	41.8 JX	0.6 U	6.1 JX	5.4	37.1 JX	15500	0.025 J	298 J	11	17	7 U	56 J	NR
32-011-WR-1	98 J	17.2 JX	1.2	7.8 JX	4.3	1150 JX	21700	0.318 J	398 J	11	3370	8	478 J	NR
BACKGROUND	14 J	689 JX	0.8	7 JX	3.9	17.8 JX	13100	0.1 J	3380 J	16	43	6	329 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000
32-011-WR-1	0.21	6.56	3.29	-3.3	0.08	0.01	0.12	0.31	2.98

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
32-011-SW-1	1.49 U	4.27 JX	2.57 U	9.7 U	6.83 U	7.73 J	31	0.056 J	4.08 U	12.7 U	2.24 J	30.7 U	37.7 J	23
32-057-SW-1	1.81	2.13 JX	2.57 U	9.7 U	6.83 U	2.63 J	36.1	0.097 J	4.08 U	12.7 U	1.29 J	30.7 U	19.9 J	20.3

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-011-SW-1	93	< 5.0	< 5	< 0.05	NR
32-057-SW-1	49	< 5.0	< 5	< 0.05	NR

LEGEND

32-011-SE1 - 20' below bridge, also below confluence of unnamed tributary.  
32-057-SE1 - Downgradient of Hautilla mine, upgradient for Lost Cabin.  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.  
BACKGROUND - From the Lost Cabin Mine (32-001-SS-1).  
SW1 - Same as sample 32-011-SE-1.  
SW2 - Same as sample 32-057-SE-1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Nugget</u>	County: <u>Missoula</u>
Legal Description: T <u>16N</u> R <u>23W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 13</u>
Mining District: <u>Nine Mile</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 47° 08' 50"</u>	Primary Drainage: <u>Kennedy Creek</u>
Longitude: <u>W 114° 26' 45"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Kennedy Creek</u>
Quad: <u>McCormick Peak</u>	Date Investigated: <u>July 2, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>32-042</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 1300 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 150J mg/kg                      Copper: 9378J mg/kg  
Lead: 2340 mg/kg
- The waste rock dumps were 75% unvegetated.
- One discharging adit had a small flow of approximately 1.3 gpm. The adit water was sampled as GW-1 and had a neutral pH of 7.09, and a moderate specific conductance of 108.6 umhos/cm. The adit discharge flowed into a small settling pond constructed in the waste rock prior to discharging directly to Kennedy Creek. No MCL/MCLGs were exceeded. Chronic aquatic life criteria were exceeded for mercury, copper, lead, and zinc, and the acute aquatic life criteria were exceeded for copper and zinc in the adit discharge.
- Surface water samples were collected upstream and downstream on Kennedy Creek which bisected the site. There were no observed releases to surface water documented and the samples did not exceed MCL/MCLGs. Acute and chronic aquatic life criteria were exceeded in Kennedy Creek but could not be attributed to this site due to upgradient sources (the Lost Cabin and Hautilla Mines). Stream sediment samples did document observed releases of copper and lead, attributable to this site.
- The discharging adit was open and hazardous. WR-1 was being undercut by Kennedy Creek.

**Nugget PA# 32-042**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 07/02/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
32-042-SE-1	32 J	17.6 JX	0.4 U	4.6 JX	2	642 JX	12400	0.015 J	238 J	7	227	5 U	301 J	NR
32-011-SE-1	26 J	43.6 JX	0.6 U	10.1 JX	5.4	177 JX	24300	0.199 J	548 J	16	346	7 U	293 J	NR
32-042-WR-1	150 J	10.1 JX	0.5 U	4 JX	1.3 U	378 JX	21600	0.196 J	143 J	9	2340	11	330 J	NR
BACKGROUND	14 J	689 JX	0.8	7 JX	3.9	17.8 JX	13100	0.1 J	3380 J	16	43	6	329 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL			SULFUR			PYRITIC			ORGANIC			SULFUR		
	SULFUR	ACID BASE	%	NEUTRAL	POTENT.	%	SULFUR	ACID BASE	POTENT.	SULFUR	ACID BASE	POTENT.	SULFUR	ACID BASE	POTENT.
	1000x	1000x		1000x	1000x		1000x	1000x	1000x	1000x	1000x	1000x	1000x	1000x	1000x
32-042-WR-1	0.24	7.5	3.65	0.8	7 JX	3.9	17.8 JX	13100	0.1 J	3380 J	16	43	6	329 J	NR

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-042-GW-1	2.63	7.23 JX	2.57 U	9.7 U	6.83 U	38.6 J	377	0.096 J	88.1	12.7 U	6.1 J	30.7 U	1370 J	33
32-042-SW-1	1.49 U	4.03 JX	2.57 U	9.7 U	6.83 U	6.7 J	25.8	0.071 J	4.08 U	12.7 U	1.67 J	30.7 U	60.1 J	23.2
32-011-SW-1	1.49 U	4.27 JX	2.57 U	9.7 U	6.83 U	7.73 J	31	0.056 J	4.08 U	12.7 U	2.24 J	30.7 U	37.7 J	23

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
32-042-GW-1	76	< 5.0	9	< 0.05	NR
32-042-SW-1	63	< 5.0	< 5	< 0.05	NR
32-057-SW-1	49	< 5.0	< 5	< 0.05	NR

**LEGEND**

32-042-SE1 - Downstream of site.  
 32-011-SE1 - 20' below bridge, below Lost Cabin Mine.  
 WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 BACKGROUND - From the Lost Cabin Mine (32-011-SS-1).  
 GW1 - At mouth of adit #1.  
 32-042-SW1 - Same as corresponding SE1 sample.  
 32-011-SW1 - Same as corresponding SE1 sample.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Ward Lode</u>	County: <u>Missoula</u>
Legal Description: T <u>11N</u> R <u>22W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 21</u>
Mining District: <u>Woodman</u>	Mine Type: <u>Hardrock/Ag, Pb</u>
Latitude: <u>N 46° 41' 42"</u>	Primary Drainage: <u>South Fork Lolo Creek</u>
Longitude: <u>W 114° 21' 40"</u>	USGS Code: <u>17010205</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Dick Creek</u>
Quad: <u>Dick Creek</u>	Date Investigated: <u>September 8, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>32-005</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 321,200 cubic yards. The following elements were elevated at least three times background:

Arsenic: 68.3 to 89.8 mg/kg	Cadmium: 2.5 to 12.1 mg/kg
Chromium: 55.2 to 86.9 mg/kg	Copper: 70.5J to 77.9J mg/kg
Nickel: 55.5 to 79.1 mg/kg	Lead: 588 to 590 mg/kg
Zinc: 1990 to 7660 mg/kg	
- One possible adit discharge was observed at this site during the investigation. No MCLs were exceeded in the adit discharge; however, acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead and zinc.
- A sediment sample was collected just below the settling basin associated with the adit discharge. Arsenic, lead, and zinc concentrations were significantly elevated (greater than three times background) in the sediment sample.
- Potential safety hazards identified at the site included a 50 feet tall highwall associated with the trench and an over-steepened waste rock dump (WR-1) which was actively eroding.

Ward Lode Mine PA# 32-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-BULLOCK  
INVESTIGATION DATE: 09/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Cyanide (mg/Kg)
32-005-SE-1	39.2 J	190	1.8	3.47	7.24	11	5680	0.031 U	638	9.2	104	6.96 UJ	385 J	NR
32-005-WR-1	68.3	618 J	2.5	8.78 J	55.2	70.5 J	21900	0.061	1750 J	55.5	590	5.27 UJ	1990	NR
32-005-WR-2	89.8	806 J	12.1	7.97 J	86.9	77.9 J	26700	0.036	2790 J	79.1	588	9.36 J	7660	NR
BACKGROUND	5.04 U	357 J	0.6 U	8.34 J	8.69	5.95 J	10700	0.144	2320 J	7.66	18.4	6.56 UJ	58.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL				TOTAL				PYRITIC				PYRITIC				PYRITIC			
	TOTAL SULFUR	ACID BASE	POTENT.	%	TOTAL SULFUR	ACID BASE	POTENT.	%	TOTAL SULFUR	ACID BASE	POTENT.	%	TOTAL SULFUR	ACID BASE	POTENT.	%	TOTAL SULFUR	ACID BASE	POTENT.	%
32-005-WR-1	0.04	1.25	7.29	6.04	<0.01	0.03	0.01	0.01	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.01
32-005-WR-2	0.62	19.4	32.5	13.1	0.13	0.15	0.34	0.34	0.15	0.15	0.34	0.34	0.15	0.15	0.34	0.34	0.15	0.15	0.34	0.34
32-005-WR-2DUP	0.61	19.1	32.6	13.6	0.13	0.15	0.33	0.33	0.15	0.15	0.33	0.33	0.15	0.15	0.33	0.33	0.15	0.15	0.33	0.33

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
32-005-SW-1	3.34	81.7	2.9 J	9.7 U	6.83 U	10.3 J	238	0.12 UJX	77.1	12.7 UX	12.8	30.7 U	243 J	6.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE	TOTAL
32-005-SW-1	65	< 5.0	< 5.0	< 0.05	NR	NR

LEGEND

SE1 - Below outlet of settling pond in drainage.  
WR1 - Composite of subsamples WR1A through 1D.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From the Mill Creek Mine (32-049-S5-1).  
WR2DUP - Duplicate of the 32-005-WR-2 sample.

SW1 - In trench prior to entering settling pond.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Allison</u>	County: <u>Park</u>
Legal Description: <u>T 7S R 9E</u>	Section(s): <u>SW 1/4, NE 1/4, Sec. 6</u>
Mining District: <u>Emigrant</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Mo</u>
Latitude: <u>N 45° 15' 28"</u>	Primary Drainage: <u>Yellowstone River</u>
Longitude: <u>W 110° 40' 02"</u>	USGS Code: <u>10070002</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Emigrant Creek</u>
Quad: <u>Emigrant</u>	Date Investigated: <u>August 12, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>34-018</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 5660 cubic yards. Mercury (0.114-1.14 mg/kg) was the only element elevated at least three times background.
- The waste rock dumps were mostly unvegetated.
- The discharging adit, sampled as GW-1, was flowing at approximately 100 gpm, with a pH of 9.30, and a specific conductance of 80 umhos/cm. The discharge did not exceed any MCL/MCLGs; however, acute aquatic life standards for cadmium, copper, and zinc and chronic aquatic life standards for iron, cadmium, copper, lead, and zinc were exceeded in the adit discharge. A borehole at the base of WR-1 was also discharging at about 20 gpm. The pH from the discharge was neutral at 6.87, and had a specific conductance of 300 umhos/cm. This discharge, sampled as GW-2, did not exceed drinking water standards; however, it did exceed the acute aquatic life criteria for cadmium and zinc as well as the chronic aquatic life criteria for iron, cadmium, lead, and zinc.
- There were no direct runoff pathways from this site to Emigrant Creek in the drainage below, therefore, no samples were collected in the Creek.

**Allison PA# 34-018**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/12/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-018-WR-1	15.5	59.1 J	0.92 J	2.63	1.54	416	25800	0.114	365	3.17	232	6.24 UJ	80.5	NR
34-018-WR-2	31.1	72.6 J	1.01 J	7.44	3.89	385	46800	1.14	329	4.55	126	5.41 UJ	119	NR
BACKGROUND	32.8	175 J	1.32 J	3.87	10.4	165	29500	0.028 U	484	9.84	242	6.52 UJ	96.5	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR %	ACID BASE	POTENT. v/1000x	NEUTRAL. POTENT. v/1000x	ACID BASE POTENT. v/1000x	ORGANIC %	SULFUR %	ACID BASE POTENT. v/1000x	PYRITIC %	SULFUR %	ACID BASE POTENT. v/1000x	ACID BASE POTENT. v/1000x
34-018-WR-1	0.65	20.3	-0.21	-0.21	-20.5	0.33	0.02	0.62	0.33	0.62	-0.83	-0.83
34-018-WR-2	0.21	6.56	-0.26	-0.26	-6.82	0.08	<0.01	0.00	0.08	0.00	-0.26	-0.26

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
34-018-GW-1	4.1	9.57	2.83	12.1	6.83 U	268 J	12500	0.120 U	989	25.7	1.84	30.7 U	1050	20.2
34-018-GW-2	18.3	18.4	4.63	9.7 U	6.83 U	2.3 J	15100	0.120 U	684	20.2	21.5	30.7 U	2190	111

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-018-GW-1	189	< 5.0	77	< 0.05	NR
34-018-GW-2	216	< 5.0	77	< 0.05	NR

**LEGEND**

WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 WR2 - Composite of subsamples WR2A and 2B.  
 BACKGROUND - From the Allison Mine (34-018-SS-1).  
 GW1 - Discharging adit associated with waste rock dump 1.  
 SW1 - Discharge from bore hole at base of waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Great Republic Smelter</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 14E</u>	Section(s): <u>SW 1/4, NE 1/4, NW 1/4, Section 36</u>
Mining District: <u>New World</u>	Mine Type: <u>Smelter, Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 45° 00' 59"</u>	Primary Drainage: <u>Soda Butte Creek</u>
Longitude: <u>W 109° 56' 13"</u>	USGS Code: <u>10070001</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Woody Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 17, 1994</u>
Inspectors: <u>Tuesday, Bisch, West</u>	P.A. # <u>34-000</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site; however, the volume of smelter slag observed e was estimated to be 3,840 cubic yards. The following elements were elevated to at least three times the background concentrations in the slag:

Arsenic: 1,150 mg/kg	Manganese: 68,700J mg/kg
Cadmium: 23.9 mg/kg	Lead: 38,200 mg/kg
Copper: 939 mg/kg	Antimony: 91.0J mg/kg
Iron: 81,400 mg/kg	Zinc: 23,700 mg/kg
- The volume of waste rock observed at the site was estimated to be 15 cubic yards. The following elements were elevated to at least three times the background concentrations:

Arsenic: 9,220 mg/kg	Manganese: 69,000J mg/kg
Cadmium: 210 mg/kg	Lead: 42,100 mg/kg
Copper: 1,600 mg/kg	Antimony: 95.7J mg/kg
Iron: 121,000 mg/kg	Zinc: 18,300 mg/kg
Mercury: 1.17 mg/kg	
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
- Woody Creek flows adjacent to the site on the north side. The slag pile was on the bank of Woody Creek and was being actively undercut by the stream. No observed releases were documented. The chronic aquatic life criteria for iron, mercury, and lead were exceeded both upstream and downstream from the site.
- The severely undercut slag pile was the only safety hazard observed at the site.

Great Republic Smelter PA# 34-000  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/17/84

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	Ag (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-000-SE1	0.7 U	5.6 U	157	1.0	13.2	19.7	24.8	21800	0.07	374 J	34.4	7.4 U	8.7 U	44.2	NR
34-000-SE2	1.8	7.0 U	152	1.4	13.9	20.8	24.3	20800	0.06	371 J	39.7	9.2 U	10.8 U	41.8	NR
34-000-SL1	86.0	1150	187	23.9	4.4	23.9	939	81400	0.02 U	68700 J	2.9 U	38200	91.0 J	23700	NR
34-000-WR1	97.3	9220	70.0	210	15.7	17.0	1600	121000	1.17	69000 J	3.2 U	42100	95.7 J	18300	NR
BACKGROUND	NR	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE U/1000	NEUTRAL POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000	SULFUR ORGANIC %	PYRITIC SULFUR ACID BASE U/1000	PYRITIC SULFUR ACID BASE POTENT. U/1000	SULFUR ACID BASE U/1000
34-000-WR1	2.32	72.5	25.1	-47	1.82	67.8	-42.7	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	Ag	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-000-SW1	0.12 U	1.7 JX	17.1	4.0 U	8.4 U	10.0	6.2	1800	0.24	18.1	22.0 JX	2.8	51.6 U	15.6 U	58.4
34-000-SW2	0.12 U	1.7 JX	21.9	4.0 U	8.4 U	6.8 U	5.9 U	2340	0.22	33.5	14.4 UX	2.7	51.6 U	17.4	60.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-000-SW1	8	<5	7.0	<0.05	NR
34-000-SW2	10	<5	7.0	<0.05	NR

LEGEND

SE1 - Woody Creek downstream from site, above bridge.

SE2 - Woody Creek upstream from site, approx. 150'.

SL1 - Composite of subsamples SE1A and SE1B.

WR1 - A grab sample from subsample WR1.

BACKGROUND - From the Little Daisy Mine (34-000-SB1) (0993 Data).

SW1 - Same as sample 34-000-SE1.

SW2 - Same as sample 34-000-SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>McLaren Tailings</u>	County: <u>Park</u>
Legal Description: T <u>19S</u> R <u>14E</u>	Section(s): <u>S 1/2, NE 1/4, Sec. 25</u>
Mining District: <u>Cooke City</u>	Mine Type: <u>Mill Tailings</u>
Latitude: <u>N 45° 01' 34"</u>	Primary Drainage: <u>Yellowstone River</u>
Longitude: <u>W 109° 55' 29"</u>	USGS Code: <u>10070001</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Soda Butte Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 10, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>34-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- Previous reclamation work has been conducted on this site which included dam stabilization, run-on control, grading, covering and revegetation.
- The volume of tailings associated with this site was estimated to be approximately 370,000 cubic yards. The following elements were elevated at least three times background:

Cadmium: 2.58 to 3.0 mg/kg	Copper: 1700 to 3680 mg/kg
Iron: 107,000 to 163,000 mg/kg	Mercury: 0.179 mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 8,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 45.3 mg/kg	Cadmium: 1.99 mg/kg
Copper: 846 mg/kg	Iron: 105,000 mg/kg
- A groundwater seep was identified at the toe of the tailings. No MCLs were exceeded in the seep; however, the chronic aquatic life criteria for iron was exceeded. In addition, no MCLs were exceeded in a sample collected from a monitoring well located at the west end of the tailings. Residents living directly downgradient of this site were serviced by a municipal water supply.
- Surface water samples were collected upstream and downstream from the site in Soda Butte Creek, and in Miller Creek prior to its confluence with Soda Butte Creek. An observed release to Soda Butte Creek was documented for iron; however, the concentration of iron in the downstream sample did not exceed any established standards. No MCLs were exceeded in any of the samples. The only aquatic life criteria exceedance observed was the chronic lead standard in the Miller Creek sample.

McLaren Tailings PA# 34-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/10/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-004-SE-1	10.6 J	86.2	0.61 U	11.9	14.4 J	214	20400	0.047	557	19.7	59.1	7.24 UJ	98.2	NR
34-004-SE-2	7.37 J	93.5	0.60 U	12.9	17 J	243	15400	0.035 U	504	23.1	55.1	7.11 UJ	98.7	NR
34-004-SE-3	4.12 U	88	0.45 U	7.91	13 J	103	20500	0.04 U	658	14.3	116	5.36 UJ	102	NR
34-004-TP-1	26.3 J	73.8	2.58	6.79	17.5 J	1700	107000	0.105	217	10.4	69	7.16 UJ	81.9	NR
34-004-TP-2	41.6 J	69.3	3.00	12.8	21.6 J	3680	163000	0.179	576	14.4	104	6.71 UJ	162	NR
34-004-WR-1	45.3 J	101	1.99	5.13	17.5 J	846	105000	0.099	191	8.87	208	6.18 UJ	80.1	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	U/1000	%	U/1000	POTENT.	U/1000	POTENT.	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	POTENT.	U/1000
34-004-TP-1	6.10	191			116		-74.9		<0.01		7.05		0.82		220		-105	
34-004-TP-2	14.1	440			9.83		-431		2.89		4.21		7.00		132		-122	
34-004-WR-1	1.14	35.6			-3.22		-38.8		0.76		0.01		0.37		0.31		-3.53	

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-004-GW-1	1.57 JX	58.7	2.57 U	32	6.83 U	4.37 JX	117000	0.29	4240	26.5 J	2.28 J	30.7 U	79	731
34-004-GW-2	1.43 JX	25	2.57 U	9.7 U	17.1	3.1 JX	96200	0.22	2010	12.7 U	2.95 J	30.7 U	7.57 U	2850
34-004-SW-1	1.12 UJX	45.7	2.57 U	9.7 U	6.83 U	8.87 JX	827	0.22	82.8	12.7 U	3.2 J	30.7 U	9.1	119
34-004-SW-2	1.14 JX	29.3	2.57 U	9.7 U	6.83 U	8.5 JX	75.6	0.22	5.03	12.7 U	3.05 J	30.7 U	13.8	78.7
34-004-SW-3	1.84 JX	54.8	2.57 U	9.7 U	6.83 U	4.1 JX	32.8	0.4	5.77	15.7 J	2.3 J	30.7 U	11.3	125

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-004-GW-1	1180	5	692	< 0.05	NR
34-004-GW-2	4360	5	2680	< 0.05	NR
34-004-SW-1	165	< 5.0	25	< 0.05	NR
34-004-SW-2	115	7	21	< 0.05	NR
34-004-SW-3	155	< 5.0	7	< 0.05	NR

LEGEND

- SE1 - Downgradient on Soda Butte Creek.  
SE2 - Miller Cr. just above confluence with Soda Butte Creek.  
SE3 - Upgradient on Soda Butte Creek.  
TP1 - Composite of subsamples TP1A-A, 1B-A, and 1C-A.  
TP2 - Composite of subsamples TP1A-B, 1B-B, 1B-C, 1B-D, 1B-E, 1C-B, and 1C-C.  
WR1 - Composite of subsamples WR1A and 1B.  
BACKGROUND - From the Little Daisy Mine (34-005-S5-1).
- GW1 - Seepage at toe of tailings.  
GW2 - Monitor well at West end of tailings.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lower Glengarry</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 14E</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 11</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 04' 05"</u>	Primary Drainage: <u>Clark Fork Yellowstone</u>
Longitude: <u>W 109° 56' 05"</u>	<u>River</u>
Land Status: <u>Private/Public</u>	USGS Code: <u>10070006</u>
Quad: <u>Cooke City</u>	Secondary Drainage: <u>Fisher Creek</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	Date Investigated: <u>August 9, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>34-006</u>

- The volume of tailings associated with this site was estimated to be approximately 782 cubic yards. The following elements were elevated at least three times background:  
Copper: 377 mg/kg                      Iron: 141,000 mg/kg  
Lead: 106J mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 17,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 50.2J to 53.6J mg/kg                      Cadmium: 3.6 mg/kg  
Copper: 421 to 1260 mg/kg                      Iron: 60,000 to 185,000 mg/kg  
Mercury: 2.14J mg/kg                      Lead: 109J to 116J mg/kg
- Two discharging adits and a groundwater seep (located at the base of WR-1) were observed at the site during the investigation. The discharge from Adit #1 exceeded the MCL for copper and acute and chronic aquatic life criteria for copper and zinc. Additionally, the Adit #1 discharge exceeded the chronic aquatic life criteria for iron, mercury, and lead. The discharge from Adit #2 and the seep exceeded the acute and chronic aquatic life criteria for copper and zinc as well as chronic aquatic life criteria for iron, mercury, and lead. Adit discharge pH measurements were 3.23 and 3.85 for Adit #1 and Adit #2, respectively; and the pH measurement in the seep was 3.43.
- Several surface water and sediment samples were collected at the site during the investigation, including: upstream and downstream samples in Fisher Creek; and samples from an unnamed tributary to Fisher Creek. Observed releases of iron, mercury, and lead were documented and attributable to this site. The MCL/MCLG for copper was exceeded and attributable to this site. Although several aquatic life criteria were exceeded upstream and downstream of the site, the chronic criteria for iron was the only standard attributable to the site. The upstream surface water samples indicated the presence of an upgradient source (the Upper Glengarry Mine).
- Potential hazards that were observed at the site included two adits (one with a locked gate, and one partially caved-in) and two collapsing cabins.

**Lower Glengarry PA# 34-006**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/08/93**

**SOLID MATRIX ANALYSES**

**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-006-SE-1	86.6 J	113	0.6 U	4.14 J	9.39	371	57500	0.066 J	492 J	2.76 U	92.1 J	6.69 U	74	NR
34-006-SE-2	20.1 J	76.2	0.7 U	5.5 J	11.8	601	93900	0.051 J	494 J	5.45	377 J	8.46 U	197	NR
34-006-SE-3	74.6 J	98.8	0.7 U	2.83 J	6.21	415	54500	0.042 J	319 J	5.21	73.1 J	8.39 U	67.9	NR
34-006-TP-1	22.6 J	33.4	0.7 U	3.96 J	32.1	377	141000	0.036 J	73.7 J	5.1	106 J	8.42 U	41.1	NR
34-006-WR-1	50.2 J	142	0.5 U	2.11 J	4.67	421	60000	2.14 J	233 J	2.34 U	109 J	5.67 U	29.1	NR
34-006-WR-2	53.6 J	11.8	3.6	1.96 U	1.38 U	1260	185000	0.038 J	1.45 J	2.56 U	116 J	6.2 U	50.1	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.02 J	461 J	23.9	28.3 J	5.49 U	69.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
34-006-WR-1	0.77	24.1	-1.68	-25.7	0.23	0.16	0.38	5.00	-6.68			
34-006-WR-2	45.6	1426	-4.79	-1431	0.31	<0.01	47.2	0.00	-4.79			
34-006-WR-3	0.75	23.4	-4.13	-27.6	0.32	<0.01	0.53	0.00	-4.13			

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-006-GW-1	7.31	8.3	2.57 U	46.1	10.6	7730 JX	85600 JX	0.09 J	5610	99.2 J	40.1	30.7 U	671	202
34-006-GW-2	2.27	13.7	2.57 U	21.4	6.83 U	121 JX	14200 JX	0.11 J	1020	20.5 J	2.45	30.7 U	127	38.8
34-006-SW-1	1.21	28.6	2.57 U	11.7	6.83 U	1340 JX	7960 JX	0.25 J	794	26 J	9.56	30.7 U	133	47.2
34-006-SW-2	1.89	20.1	2.57 U	15.4	6.83 U	1170 JX	3160 JX	0.08 J	722	32.5 J	8.2	30.7 U	137	42.6
34-006-SW-3	1.93	37.1	2.57 U	9.7 U	6.83 U	761 JX	187 JX	0.07 J	56.4	12.7 U	3.17	30.7 U	34.7	7.1
34-006-SW-4	0.96 U	42.5	2.57 U	9.7 U	6.83 U	646 JX	3750 JX	0.09 J	346	13.9 J	6.49	30.7 U	55.9	24.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-006-GW-1	763	10	489	< 0.05	NR
34-006-GW-2	165	< 5.0	77	< 0.05	NR
34-006-SW-1	168	< 5.0	87	< 0.05	NR
34-006-SW-2	186	< 5.0	94	< 0.05	NR
34-006-SW-3	98	< 5.0	26	0.11	NR
34-006-SW-4	121	< 5.0	56	0.05	NR

**LEGEND**

- SE1 - Downgradient of site on Fisher Creek.
- SE2 - Upgradient of site on headwaters of Fisher Creek.
- SE3 - Upgradient stream (unnamed).
- TP1 - Composite of subsamples TP1A, 1B, and 1C.
- WR1 - Composite of subsamples WR1A, 1B, and 1C.
- WR2 - Sample of the WR2 subsample.
- BACKGROUND - From the Lower Glengarry Mine (34-006-SB-1).
- GW1 - Discharge from edit #1.
- GW2 - Discharge from edit #2.
- SW1 - Downgradient of site on Fisher Creek.
- SW2 - Discharge from waste rock dump 1 base.
- SW3 - Upgradient of site on headwaters of Fisher Creek.
- SW4 - Upgradient stream (unnamed).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Gold Dust</u>	County: <u>Park</u>
Legal Description: T <u>9S</u> R <u>14E</u>	Section(s): <u>SE 1/4, SE 1/4, Sec. 11</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 04' 01"</u>	Primary Drainage: <u>Clark Fork Yellowstone</u>
Longitude: <u>W 109° 56' 33"</u>	<u>River</u>
Land Status: <u>Private/Public</u>	USGS Code: <u>10070006</u>
Quad: <u>Cooke City</u>	Secondary Drainage: <u>Fisher Creek</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	Date Investigated: <u>August 9, 1993</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>34-007</u>

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 8,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 34.9J to 40.3J mg/kg    Mercury: 0.256J to 1.15J mg/kg
- One discharging adit was identified at the site. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded.
- An unnamed tributary to Fisher Creek was observed flowing adjacent to the waste rock dump at the site and received the adit discharge. There were no documented releases to this drainage and no MCL/MCLGs were exceeded in surface water samples collected upstream and downstream from the site. The stream sediment samples documented an observed release to the tributary for mercury.
- A potentially hazardous wooden loadout structure was identified at the site, and explosives may have been stored in the newer mine buildings.

Gold Dust PA# 34-007  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-007-SE-1	20.2 J	76.8	1.3	12.8 J	19.7	378	33200	0.065 J	835 J	25.9	245 J	6.51 J	403	NR
34-007-SE-2	19.1 J	48.3	1.9	24.1 J	11.4	547	23500	0.014 J	1580 J	33.8	309 J	8.13 U	472	NR
34-007-WR-1	40.3 J	85.8	0.8	4.2 J	14.1	180	47600	1.15 J	157 J	8.74	68.2 J	5.93 U	66.1	NR
34-007-WR-2	34.9 J	56.9	0.5 U	10.6 J	20.4	98.4	30500	0.256 J	339 J	24.8	51.2 J	5.45 U	83.3	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	68.9	17100	0.02 J	461 J	23.9	28.3 J	5.49 U	69.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		ACID BASE	
	%	U/1000x	ACID BASE	POTENT.	NEUTRAL.	POTENT.	ACID BASE	POTENT.	SULFUR	%	SULFUR	%	SULFUR	%	U/1000x	ACID BASE	POTENT.	U/1000x
34-007-WR-1	0.27	8.43		0.35		-8.08		0.12		0.04		0.11		1.25				-0.90
34-007-WR-2	4.67	146		61.6		-84.3		<0.01		2.06		2.83		64.4				-2.76

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-007-GW-1	3.06	16.9	2.57 U	9.7 U	6.83 U	6.53 JX	144 JX	0.11 J	55.7	13.5 J	2.17	30.7 U	11.1	381
34-007-SW-1	1.81	38.4	2.57 U	9.7 U	6.83 U	11.4 JX	58.7 JX	0.06 J	13	15 J	2.9	30.7 U	70	152
34-007-SW-2	1.39	38	2.57 U	9.7 U	6.83 U	11.5 JX	40 JX	0.1 J	11.3	12.7 U	3.58	30.7 U	96.1	138

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-007-GW-1	581	< 5.0	282	0.07	NR
34-007-SW-1	256	< 5.0	117	0.06	NR
34-007-SW-2	231	< 5.0	109	0.18	NR

LEGEND

SE1 - Downgradient of site in unnamed stream.  
SE2 - Upgradient of site in unnamed stream.  
WR1 - Composite of subsamples WR1A and 1D.  
WR2 - Composite of subsamples WR1B and 1C.  
BACKGROUND - From the Lower Gtengary (34-006-SS-1).

GW1 - Discharge from edit.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Little Daisy</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 14E</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 14</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Zn, Pb</u>
Latitude: <u>N 45° 03' 10"</u>	Primary Drainage: <u>Soda Butte Creek</u>
Longitude: <u>W 109° 57' 09"</u>	USGS Code: <u>10070001</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Miller Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 9, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>34-009</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 3,220 cubic yards of mostly covered waste rock on site. The following were elevated at least 3 times background:
  - Cadmium: 1.7 to 2.3 mg/kg
  - Copper: 138 to 1,520 mg/kg
  - Iron: 78,200 to 80,500 mg/kg
  - Mercury: 0.222J to 1.08J mg/kg
  - Zinc: 546 mg/kg
- There were two discharging adits on site, but neither entered surface water directly; pH's were 7.24 and 7.60. One adit was sampled; no MCL/MCLG's were exceeded.
- Miller Creek flows adjacent to waste rock. There were no observed releases to downstream surface water or sediment. No MCL/MCLGs were exceeded in downstream surface water. Chronic fresh water aquatic life criteria for mercury and lead were exceeded in both upstream and downstream surface water, indicating an upstream source.
- There were no hazardous openings on site.

Little Daisy PA# 34-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-009-SE-1	12.7 U	136	1.4 U	22.4 J	43.9	279	38200	0.097 J	2610 J	42.7	72.9 J	16.5 U	380	NR
34-009-SE-2	11.4 J	46.5	0.6 U	7.9 J	12.4	146	22100	0.105 J	593 J	11.6	92.4 J	6.8 U	106	NR
34-009-WR-1	19.1 J	26.3	1.7	3.94 J	27.7	1520	80500	1.08 J	1510 J	19.3	238 J	4.69 U	201	NR
34-009-WR-2	17.4 J	71.2	2.3	9.91 J	24.8	763	78200	0.175 J	2520 J	19.9	431 J	6.28 U	548	NR
34-009-WR-3	7.22 J	29	0.5 U	12.5 J	17.1	138	29400	0.222 J	618 J	17.1	49.3 J	5.99 U	35.1	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		SULFUR NEUTRAL		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000	%	1/1000	POTENT.	1/1000	POTENT.	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT.	1/1000
34-009-WR-1	3.59	112			48.6	-63.6			<0.01		2.00		1.87		62.5		-13.9	
34-009-WR-2	0.35	10.9			15.8	4.90			0.01		0.06		0.28		1.87		14.0	
34-009-WR-3	0.51	15.9			74.7	58.7			0.13		0.07		0.31		2.19		72.5	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-009-GW-1	3.17	9.03	2.57 U	9.7 U	6.83 U	96.1 JX	4150 JX	0.07 J	1480	37.2 J	526	30.7 U	167	551
34-009-SW-1	2.08	19.6	2.57 U	9.7 U	6.83 U	4.97 JX	11.8 UJX	0.12 J	10.4	12.7 U	1.79	30.7 U	7.57 U	161
34-009-SW-2	1.5	19.5	2.57 U	9.7 U	6.83 U	5.27 JX	24 JX	0.09 J	5.97	12.7 U	2.96	30.7 U	7.57 U	155

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-009-GW-1	730	6	341	0.31	NR
34-009-SW-1	234	< 5.0	76	0.57	NR
34-009-SW-2	235	< 5.0	75	0.57	NR

LEGEND

- SE1 - Headwaters of unnamed tributary of Miller Creek.  
SE2 - In unnamed tributary at PFE of waste rock dump 6.  
WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR2A, 2B, 3, and 4.  
WR3 - Composite of subsamples WR5 and 6.  
BACKGROUND - 100' West, 50' to North of edit #1 (WR-1).  
From Little Daisy Mine (34-009-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>McLaren Mine</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 14E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 11</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 03' 35"</u>	Primary Drainage: <u>Stillwater River</u>
Longitude: <u>W 109° 57' 30"</u>	USGS Code: <u>10070005</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Stillwater River</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 9, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>34-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 351,500 cubic yards of uncovered waste rock on site. The following were elevated at least three times background:

Cadmium: 1.9 to 2.81 mg/kg	Cobalt: 47J mg/kg
Copper: 885 to 1,030 mg/kg	Iron: 92,000 to 152,000 mg/kg
- There was one discharging adit on site, but it did not enter surface water directly. There were seeps emanating from the waste rock which entered surface water. One seep was sampled and had a pH of 3.21. The MCL/MCLGs for cadmium, copper, and nickel were exceeded, as was the chronic fresh water aquatic life criteria for iron. The chronic and acute fresh water aquatic life criteria for cadmium, copper, and zinc were exceeded.
- The seeps entered Daisy Creek 1,000 feet from the site. The seeps made up the flow of the creek, hence, no upstream surface water samples were collected. At the location the seeps entered Daisy Creek, cadmium and lead exceeded MCL/MCLGs, and the chronic fresh water aquatic life criteria for iron was exceeded. The chronic and acute fresh water aquatic life criteria for copper was also exceeded.
- There were no hazardous openings on site; but, there was one large highwall.

McLaren PA# 34-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-010-SE-1	33.5 J	41.1	2.0	3.14 J	14.7	1110	131000	0.257 J	195 J	4.7	107 J	6.79 U	123	NR
34-010-WR-1	36.3 J	45.6	1.9	47 J	1.51	1030	152000	0.077 J	27.6 J	21.7	35.4 J	5.92 U	7.71	NR
34-010-WR-2	32.9 J	143	2.81	3.51	11.1 J	887	120000	0.091	117	7.57	112	7.43 UJ	50.2	NR
34-010-WR-3	27.4 J	71.5	2.68	5.37	23.4 J	885	92000	0.049	242	9.9	222	6.76 UJ	192	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR ACID BASE		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT.	1/1000
39-010-WR-1	18.2	567	-14.5	-582	8.18	1.23	8.75	38.4	-53.0									
39-010-WR-2	1.33	41.5	-3.30	-44.8	0.59	<0.01	0.80	0.00	-3.30									
39-010-WR-3	0.55	17.2	5.47	-11.7	0.19	<0.01	0.36	0.00	5.47									

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-010-SW-1	1.34 JX	27.4	6.3 J	35.8	14.2	6520 JX	24300	1.93	2240	63.8 J	5.08 J	30.7 U	817	203
34-010-SW-5	1.12 UJX	2.01 U	20.3 J	133	41.7	26700 JX	192000	0.48	7150	141 J	6.47 J	30.7 U	3000	344

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-010-SW-1	583	< 5.0	356	< 0.05	NR
34-010-SW-5	1870	55	1210	< 0.05	NR

LEGEND

- SE1 - At confluence of three mine drainages, approx. 1000' from pit at Daisy Pass Road.  
WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR2A, 2B, and 2D.  
WR3 - Sample of the WR2C subsample.  
BACKGROUND - From the Little Daisy Mine (34-009-SS-1).
- SW1 - Same as sample SE1.  
SW5 - Discharge emanating from dump.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Black Warrior</u>	County: <u>Park</u>
Legal Description: T <u>9S</u> R <u>14E</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 15</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Ag. Au, Zn, Pb</u>
Latitude: <u>N 45° 02' 05"</u>	Primary Drainage: <u>Soda Butte Creek</u>
Longitude: <u>W 109° 57' 55"</u>	USGS Code: <u>10070001</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Miller Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 9, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>34-079</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 1,100 cubic yards of mostly uncovered waste rock on site. The following were elevated at least 3 times background:
  - Arsenic: 54J mg/kg
  - Cadmium: 7.76 mg/kg
  - Copper: 981 mg/kg
  - Mercury: 0.93 mg/kg
  - Lead: 14,600 mg/kg
  - Antimony: 25.2J mg/kg
  - Zinc: 2,490 mg/kg
- There were two discharging adits on site and both entered surface water directly. One adit discharge sample was collected; the pH was 7.22. The MCL for lead was exceeded, as was the chronic fresh water aquatic life criteria for iron and lead. The chronic and acute fresh water aquatic life criteria were exceeded for copper and zinc.
- Miller Creek flows adjacent to waste rock and there was an observed release of zinc documented to downstream surface water. No MCL/MCLGs were exceeded. The fresh water aquatic life criteria for mercury and lead were exceeded in both upstream and downstream surface water, indicating an upstream source.
- There was one open shaft with subsidence, one open adit, one hazardous loadout structure, and one collapsing cabin on site.

Black Warrior PA# 34-079  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-079-SE-1	10.9 J	62	0.92	9.67	17.8 J	35.5	17600	0.041	494	23	168	8.14 UJ	131	NR
34-079-SE-2	7.82 U	67.1	5.55	8.14	20.2 J	37.8	10000	0.055 U	61.8	20.8	78.5	10.2 UJ	743	NR
34-079-WR-1	54 J	52.3	7.76	6.34	11.2 J	981	65000	0.93	736	13.2	14600	25.2 J	2490	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.		SULFUR ACID BASE POTENT. U/1000
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	
34-079-WR-1	5.56	174	166	-8.17	<0.01	3.22	4.36	101	64.9						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-079-SW-1	1.12 UJX	18.2	2.57 U	9.7 U	6.83 U	5.53 JX	308	0.38	26.1	12.7 U	6.24 J	30.7 U	11.7	82.8
34-079-SW-2	1.12 UJX	20.7	2.57 U	9.7 U	6.83 U	9.33 JX	297	0.29	15.1	12.7 U	5.48 J	30.7 U	49.2	102
34-079-SW-3	1.12 UJX	22.2	2.57 U	9.7 U	7.73	23.4 JX	1320	0.27	65.8	12.7 U	89.8 J	30.7 U	430	127

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-079-SW-1	115	7	49	< 0.05	NR
34-079-SW-2	135	< 5.0	15	< 0.05	NR
34-079-SW-3	168	7	25	< 0.05	NR

LEGEND

- SE1 - Upgradient on Miller Creek. Approx. 75' upgradient from waste rock dump 2.  
SE2 - Downgradient of waste rock dump 2 on Miller Creek. Approx. 3' from confluence of edit discharge in creek.  
WR1 - Composite of subsamples WR1A, 1B, and 2.  
BACKGROUND - From the Little Dairy Mine (34-009-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Add discharge at waste rock dump 1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Upper Alice E.</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 14E</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 24</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 01' 58"</u>	Primary Drainage: <u>Soda Butte Creek</u>
Longitude: <u>W 109° 55' 38"</u>	USGS Code: <u>10070001</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Miller Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 10, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>34-085</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 6,600 cubic yards of uncovered waste rock on site. The following were elevated at least 3 times background:  
Copper: 120 to 174 mg/kg  
Iron: 81,800 mg/kg  
Mercury: 0.215 to 0.651 mg/kg  
Lead: 3,440 mg/kg
- There were no discharging adits at the site.
- There was no surface water at the site. The nearest surface water was approximately 200 feet away. No surface water or sediment samples were collected.
- There was one hazardous subsidence feature at the site.

Upper Alice East PA# 34-085  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/10/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-085-WR-1	17.4 J	80.4	0.80	4.23	1.4 U	174	81800	0.651	45.2	3.51	252	6.29 UJ	104	NR
34-085-WR-2	41.6 J	80.1	0.59 U	3.07	12.3 J	120	46100	0.215	63.2	6.72	3440	7.04 UJ	68	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
34-085-WR-1	11.3	354	-3.11	-357	3.11	2.65	5.56	82.8	-85.9
34-085-WR-2	0.77	24.1	-2.68	-26.7	0.53	0.09	0.15	2.81	-5.49

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, 1D, 2A, and 2B.

WR2 - Composite of subsamples WR3 and 4.

BACKGROUND - From the Little Daisy Mine (34-009-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Fisher Creek No. 1</u>	County: <u>Park</u>
Legal Description: <u>T 9S R 15E</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 18</u>
Mining District: <u>New World</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 45° 02' 15"</u>	Primary Drainage: <u>Clark Fork Yellowstone River</u>
Longitude: <u>W 109° 55' 11"</u>	USGS Code: <u>10070006</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Fisher Creek</u>
Quad: <u>Cooke City</u>	Date Investigated: <u>August 10, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>34-090</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 3,330 cubic yards of mostly uncovered waste rock on site. The following were elevated at least three times background:

Arsenic: 82.3J to 207J mg/kg	Iron: 65,900 mg/kg
Barium: 228 to 333 mg/kg	Mercury: 1.98 mg/kg
Cadmium: 3.26 mg/kg	Lead: 213 to 920 mg/kg
Copper: 255 to 449 mg/kg	Zinc: 732 mg/kg
- There were two discharging adits on site, and one enters Fisher Creek directly (SW-3); pH 6.95. Both discharges were sampled; the MCL for lead was exceeded in sample SW-3. Both discharges exceeded the acute and chronic fresh water aquatic criteria for copper.
- Fisher Creek was 1,300 feet from discharging adit SW-3. There was an observed release of mercury in the downstream sediments. No MCL/MCLGs were exceeded in downstream surface water. The chronic and acute fresh water aquatic life criteria for copper was exceeded in both the upstream and downstream surface water samples. The chronic fresh water aquatic life criteria was exceeded for lead in both upstream and downstream surface water samples, indicating an upstream source.
- There were three open adits at the site.

**Fisher Creek PA# 34-080**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/10/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-080-SE-1	16.3 J	104	0.76 U	17.6	19.8 J	1220	33900	0.092	885	21.2	59.6	9.12 UJ	159	NR
34-080-SE-2	10.7 J	76.4	0.80 U	14.6	13.9 J	1020	24600	0.641	515	17.6	54.5	9.58 UJ	121	NR
34-080-WR-1	207 J	228	3.26	3.07	1.17 U	449	65900	1.98	7.99	6.24	920	10.4 J	732	NR
34-080-WR-2	82.3 J	333	0.49 U	15.4	19.2 J	255	32900	0.055	673	25.5	213	5.8 UJ	188	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.02 J	461 J	23.9	28.3 J	5.49 U	69.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
34-080-WR-1	6.64	207	-3.57	-211	0.72	2.91	3.01	90.9	-94.5					
34-080-WR-2DUP	0.27	8.43	4.15	-4.29	0.10	0.03	0.14	0.94	3.21					
34-080-WR-2	0.25	7.81	3.81	-4.00	0.07	0.03	0.15	0.94	2.88					

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-080-GW-1	4.48 JX	40.6	2.57 U	9.7 U	6.83 U	23.4 JX	1610	0.27	102	12.7 U	5.68 J	30.7 U	36.6	75.8
34-080-GW-2	6.44 JX	38.5	2.67 J	9.7 U	6.83 U	37 JX	2190	0.23	107	34.8 J	9.21 J	30.7 U	65.9	67.2
34-080-SW-1	1.18 U	32.7	2.57 U	9.7 U	6.83 U	180	655	0.27	112	12.7 U	1.85 J	30.7 U	49.3	50.7
34-080-SW-2	1.18 U	34.6	2.57 U	9.7 U	6.83 U	169	647	0.12 U	102	12.7 U	1.86 J	30.7 U	43	48.6
34-080-SW-3	6.5	102	2.57 U	9.7 U	6.83 U	51.1	756	0.15	91.6	14.8	38.1 J	30.7 U	64	74.2

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-080-GW-1	110	8	72	0.3	NR
34-080-GW-2	112	12	30	0.32	NR
34-080-SW-1	89	10	47	0.14	NR
34-080-SW-2	88	5	44	< 0.05	NR
34-080-SW-3	89	5	17	< 0.05	NR

**LEGEND**

- SE1 - Upgradient sediment sample in Fisher Creek.  
 SE2 - Downgradient sediment sample in Fisher Creek.  
 WR1 - Composite of subsamples WR1 and 2.  
 WR2 - Sample of the WR4 subsample.  
 BACKGROUND - From the Little Daisy Mine (34-009-SS-1).  
 WR2DUP - Duplicate of the 34-009-WR-2 sample.
- GW1 - Groundwater in adit at waste rock dump 1.  
 GW2 - Duplicate of sample GW1.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.  
 SW3 - Adit discharge of waste rock dump 4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: Charter Oak  
Legal Description: T 9N R 7W  
Mining District: Elliston  
Latitude: N 46° 29' 25"  
Longitude: W 112° 25' 10"  
Land Status: Private/Public  
Quad: Bison Mountain  
Inspectors: Bullock, Babits, Flammang, Clark,  
Lasher/Pierson  
Organization: Pioneer Tech. Services//TD&H

County: Powell  
Section(s): SW 1/4, NE 1/4, Sec. 36  
Mine Type: Hardrock/Pb, Zn, Cu, Ag, Au  
Primary Drainage: Little Blackfoot River  
USGS Code: 17010201  
Secondary Drainage: Little Blackfoot River  
Date Investigated: June 11, 1993  
P.A. # 39-003

- The volume of tailings associated with this site was estimated to be approximately 6,000 cubic yards. The tailings extended out into a wetlands associated with the Little Blackfoot River. The following elements were at least three times background:

Arsenic: 14,500 to 63,700 mg/kg	Cadmium: 61J mg/kg
Copper: 198 to 318 mg/kg	Iron: 111,000 mg/kg
Mercury: 0.365JX to 0.375JX mg/kg	Lead: 3670 to 18,200 mg/kg
Antimony: 131J to 843J mg/kg	Zinc: 314J to 6650J mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 19,000 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2650 to 13,500 mg/kg	Cadmium: 1.8J to 2.0J mg/kg
Copper: 144 mg/kg	Mercury: 0.329JX to 0.984JX mg/kg
Lead: 4100 to 12,300 mg/kg	Antimony: 71J to 284J mg/kg
Zinc: 244J mg/kg	
- Two discharging adits were associated with this site. The lower, and more recently worked adit discharged approximately 10 to 15 gpm, at a pH of 2.4 to 2.5 and a specific conductance of 2380 to 3030 umhos/cm. Total arsenic concentrations in this discharge range from 24,100 to 41,900 ug/l. A dissolved arsenic sample concentration was measured at 16,100 ug/l. This discharge exceeded MCL/MCLGs for arsenic, cadmium, copper, and antimony. This discharge also exceeded aquatic life criteria for these metals and zinc. The upper adit discharge was comparatively benign with a neutral pH, no MCL/MCLG exceedances, and only exceeded the acute aquatic life criteria for iron.
- The Little Blackfoot River flowed adjacent to the site. No observed releases to the river were documented during this investigation, however, cyanide was elevated in the discharge from the wetlands to the river.
- There were several barrels of chemicals, solvents, and liquids present on the site.
- A domestic water supply well within one mile downgradient of the site had a slightly elevated arsenic concentration (10.9 ug/l), but well below the MCL of 50 ug/l.

Charter Oak PA# 39-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/1/83

SOLID MATRIX ANALYSES

Results per dry weight basis, mg/kg

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
39-003-SE-1	44	28.2	1.6 J	4.9	13.9	8.1	10300	0.026 JX	199 J	8	31	5 UJ	261 J	0.16
39-003-SE-2	107	44.7	0.6 U	6	17.5	12.1	14600	0.032 JX	291 J	13	74	5 J	156 J	NR
39-003-SE-3	81	66	0.5 U	5.8	15.8	10.7	14000	0.025 JX	397 J	8	82	5 J	150 J	NR
39-003-TP-1	14500	54	1.7 J	2.7	7.5	198	48700	0.375 JX	71.3 J	2 U	3670	131 J	314 J	NR
39-003-TP-2	63700	22.4	61 J	9.7	1.8	318	111000	0.365 JX	30.5 J	2 U	18200	843 J	6650 J	NR
39-003-WR-1	2650	62.6	1.8 J	1.2 U	2.4	34.8	27000	0.361 JX	124 J	2 U	1960	71 J	244 J	NR
39-003-WR-2	13500	55.2	1 J	1.2 U	1.6	144	26700	0.984 JX	28.3 J	2 U	12300	113 J	233 J	NR
39-003-WR-3	2930	20.4	2 J	1.3	5	50.3	34200	0.329 JX	142 J	3	4100	284 J	72 J	NR
BACKGROUN	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE V/1000	NEUTRAL POTENTIAL V/1000	SULFUR ACID BASE POTENTIAL V/1000	SULFATE %	PYRITIC %	ORGANIC %	PYRITIC SULFUR V/1000	SULFUR ACID BASE POTENTIAL V/1000	SULFUR ACID BASE POTENTIAL V/1000
39-003-TP-1	2.97	92.8	-7.8	-101	0.54	1.98	0.45	61.9	-69.7	-69.7
39-003-TP-2	13.8	430	-5.9	-436	0.79	6.25	6.72	195	-201	-201
39-003-WR-1	1.8	56.2	-1.5	-58	1.73	<0.01	0.07	0	-1.52	-1.52
39-003-WR-2	1.01	31.6	-3.5	-35	0.86	<0.01	0.15	0	-3.5	-3.5
39-003-WR-3	5.06	158	-3.3	-161	0.2	3.14	1.72	98.1	-101	-101
39-003-WR-3DUP	5.08	159	-4	-163	0.24	3.14	1.7	98.1	-102	-102

LEGEND

SED1 - AI PPE.  
SED2 - Downstream of PPE on Little Blackfoot River.  
SED3 - Upstream of PPE on Little Blackfoot River.  
TP1 - Composite of subsamples TP1A, 2A, and 3.  
TP2 - Composite of subsamples TP1C, 1E, and 2C.  
WR1 - Composite of subsamples WR1, 4, and 5.  
WR2 - Composite of subsamples WR2A and 2B.  
WR3 - Composite of subsamples WR3, 6, 7, 8, and 9.  
BACKGROUN - From the Charter Oak Mine (39-003-SS-1).  
WR3DUP - Duplicate of sample 39-003-WR-3.

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	Hardness Calc. (mg CaCO3/L)
39-003-GW-1(TM)	41900	10	140	40.1	5 U	2370	233000	0.12 J	2610	33.3	440 J	148	14500	408
39-003-GW-1A(DM)	16100	10.2	73.1	18.8	6.83 U	1180 J	120000	0.13 J	1930	18.3 J	127 J	30.7 U	8160 J	400
39-003-GW-1A(TM)	24100	10.5	97.5	25.1	6.83 U	1520 J	162000	0.12 U	2350	19.2 J	256 J	42.5	10500 J	419
39-003-GW-2(TM)	196	9.13	2.55 U	5.99 U	5 U	1.35 U	3270	0.11 J	2290	8.78 U	1.31 J	18.3 U	421	593
39-003-GW-3(TM)	10.9 J	5.37	2.57 U	9.7 U	6.83 U	3.23 J	128	0.181	6.87	12.7 U	1.57	30.7 U	50	53.7
39-003-GW-3(DM)	8.73 J	4.8	2.57 U	9.7 U	6.83 U	3.3 J	100	0.118 U	9.8	12.7 U	0.72 U	30.7 U	68.3	52.5
39-003-SW-1(TM)	20.1	7.3	2.55 U	5.99 U	5 U	1.5	182	0.077 J	31.4	8.78 U	2.18 J	18.3 U	46.4	72.9
39-003-SW-2(TM)	10.4	2.24 U	2.55 U	5.99 U	5 U	1.35 U	154	0.11 J	2.6 U	8.78 U	2.16 J	18.3 U	6 U	44.3

Wet Chemistry

Results in mg/l

Field ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-003-GW-1	1720	< 5.0	1020	< 0.05	NR
39-003-GW-2	804	< 5.0	363	< 0.05	NR
39-003-SW-1	113	< 5.0	33	< 0.05	0.02
39-003-SW-2	95	< 5.0	21	< 0.05	NR

LEGEND

GW1(TM) - Add discharge associated with waste rock dump 9; Total metals.  
GW1A(DM) - Same location, yet filtered and sampled for dissolved metals.  
GW1A(TM) - Same location, sampled for total metals.  
GW2(TM) - Add directly above old mill building - total metals.  
GW3(TM) - Well at Sunshine Keweenaw camp - total metals.  
GW3(DM) - Same location, yet filtered and sampled for dissolved metals.  
SW1(TM) - PPE - Beaver pond discharge - total metals.  
SW2 - Background and water quality sample - total metals.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lily/Orphan Boy</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 15</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Au, Pb, Zn, Ag, Cu</u>
Latitude: <u>N 46° 26' 34"</u>	Primary Drainage: <u>Telegraph Creek</u>
Longitude: <u>W 112° 20' 27"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Telegraph Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>June 28, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>39-006</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 2600 cubic yards. The following elements were elevated at least three times background:

Arsenic: 13,000 to 21,500 mg/kg	Cadmium: 5.9 mg/kg
Copper: 125 mg/kg	Iron: 71,800 mg/kg
Mercury: 0.289J to 0.861J mg/kg	Lead: 9720 to 9850 mg/kg
Antimony: 164J to 254J mg/kg	Zinc: 612 mg/kg
- The waste rock dumps were unvegetated and WR-2 was being undercut and eroded by Telegraph Creek.
- A discharging adit (GW-1) was present, with a flow of 15 gpm, a pH of 3.36, and a specific conductance of 910 umhos/cm. The adit discharge exceeded MCL/MCLGs for arsenic, cadmium, and antimony. Acute aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc and chronic aquatic life standards were exceeded for arsenic, cadmium, copper, iron, lead and zinc.
- Telegraph Creek was in contact with part of Waste Rock 2. The stream sampling was conducted during a storm runoff event. Water samples from the creek documented observed releases of arsenic, cadmium, copper, iron, lead, and zinc, as well as an exceedance of the MCL/MCLG for cadmium. The acute aquatic life criteria for copper and the chronic aquatic life criteria for iron were exceeded and directly attributable to the site. Stream sediment samples also documented releases of arsenic, cadmium, copper, iron, mercury, lead, antimony, and zinc.
- The shaft associated with Waste Rock 1 was a hazardous mine opening and has been grouted by MDSL.

Lily/Orphan Boy PA# 39-006  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/23/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-006-SE-1	4450	283	38.4	118	4.1 U	440	61800	0.106 J	14200	86	550	15 UJ	1200	NR
39-006-SE-2	104	62.8	0.5 U	15.5	3.5	11.5	18300	0.018 U	1570	13	65	4 UJ	164	NR
39-006-WR-1	13000	43.7	5.9	7	1.9	78.3	29900	0.861 J	1310	9	9720	254 J	612	NR
39-006-WR-2	21500	15.1	0.4 U	11.2	1.7	125	71800	0.289 J	43	1 U	9850	164 J	251	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR ACID BASE POTENT. v/1000	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000	SULFUR ACID BASE POTENT. v/1000
39-006-WR-1	1.78	55.6	-1.3	-57	0.49	0.56	0.73	17.5	-18.8
39-006-WR-2	8.55	267	-5.7	-273	0.54	5.61	2.4	175	-181

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-006-GW-1	881	14.5	342 J	42.1 JX	5 U	620	19200	0.038 U	5410	32.6	398	36.7	22500	132
39-006-SW-1	20.5	15.7	7.3 J	7.33 JX	7.93	11.7	1900	0.038 U	226	11	4.77	18.3 U	635	16.8
39-006-SW-2	4.3	8.87	2.55 U	5.99 UX	7	1.57	552	0.042	41.5	8.78 U	1.38	18.3 U	23.4	11

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-006-GW-1	470	< 5.0	282	< 0.05	NR
39-006-SW-1	83	< 5.0	16	< 0.05	NR
39-006-SW-2	69	< 5.0	8	< 0.05	NR

LEGEND

SE1 - Downstream of waste rock dump 2 approx. 200'  
SE2 - Upstream of pond behind waste rock dump 2.  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
WR2 - Composite of subsamples WR2A, 2B, and 2C.  
BACKGROUND - From the Ontario Millite (39-010-SS-1).  
GW1 - Collapsed edit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Monarch</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 31</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Au, Ag</u>
Latitude: <u>N 46° 24' 27"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 24' 12"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Monarch Creek</u>
Quad: <u>Bison Mountain</u>	Date Investigated: <u>August 18, 1993</u>
Inspectors: <u>Bullock, Belanger</u>	P.A. # <u>39-008</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation. The claim holder was in the process of assembling a small-scale mill but had not achieved production at the time of this investigation.
- The volume of waste rock associated with the site was estimated to be approximately 4,200 cubic yards. The following elements were elevated at least three times background:

Arsenic: 163J mg/kg	Copper: 727J mg/kg
Mercury: 1.85J mg/kg	Manganese: 4240J mg/kg
Lead: 469J mg/kg	Antimony: 195 mg/kg
- One discharging adit was observed at the site during the investigation. No MCLs were exceeded in the adit discharge; however, the chronic aquatic life criteria for mercury was exceeded. The discharge had a pH measurement of 9.0 and a specific conductance of 780 umhos/cm. After flowing adjacent to the waste rock dump for its entire length, the discharge had a pH measurement of 8.26 and a specific conductance of 180 umhos/cm.
- One potentially hazardous adit opening was identified at the site, as well as one potentially hazardous structure.

Monarch PA# 39-008  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/18/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-008-WR-1	163 J	40 J	3.3	8.49	2.85	727 J	42100 J	1.85 J	4240 J	3.49	469 J	195	109 J	NR
BACKGROUND	22.6 J	141 J	1.4	7.17	8.13	18.9 J	16600 J	0.043 J	835 J	5.56	37 J	6.78 U	90.9 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR	ACID BASE	NEUTRAL	ACID BASE	POTENT.	POTENT.	ACID BASE	ACID BASE	POTENT.	ACID BASE	POTENT.	POTENT.
39-008-WR-1	1	31.2	6.19	-25	0.44	0.31	0.25	9.68	-3.5			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-008-GW-1	4.21	19.6	2.57 U	9.7 U	6.83 U	1.67 J	46.7	0.19 J	41.6	12.7 U	2.19 J	30.7 U	38.5 J	115

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL	DISSOLVED	SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-008-GW-1	167	<	5.0	133	<	0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
BACKGROUND - From the Monarch Mine (39-008-SS-1).

GW1 - Discharge from adit associated with waste rock dump 1.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Ontario Millsite</u>	County: <u>Powell</u>
Legal Description: <u>T 8N R 6W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 22</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Pb, Zn, Cu, Ag, Au</u>
Latitude: <u>N 46° 25' 45"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 15' 00"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Ontario Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>June 10, 1993</u>
Inspectors: <u>Babits, Bullock, Flammang, Clark, Lasher/Pierson</u>	P.A. # <u>39-010</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- The volume of tailings on site was estimated to be approximately 5,110 cubic yards. Additionally, an undetermined volume of tailings have been deposited in the floodplain 1/2 mile downstream in an unnamed tributary and Ontario Creek. The following elements were elevated at least three times background:  
Arsenic: 1,510 to 2,730 mg/kg      Lead: 1,290 to 2,090 mg/kg  
Cadmium: 13.8J to 30.7J mg/kg      Antimony: 55J to 130J mg/kg  
Copper: 178 to 628 mg/kg      Zinc: 1,770 to 2,530 mg/kg  
Mercury: 0.085JX to 0.113JX mg/kg
- The volume of waste rock associated with this site was estimated to be approximately 25,750 cubic yards. The following elements were elevated at least three times background (based on XRF analyses):  
Arsenic: 905 mg/kg      Lead: 393 to 1,396 mg/kg  
Barium: 454 to 701 mg/kg
- Two discharging adits (collapsed) were observed at the site during the investigation. MCLs were exceeded for arsenic, cadmium, and antimony in the Adit #1 discharge. Acute and chronic aquatic life criteria were exceeded for arsenic, cadmium, copper, lead, and zinc, and chronic aquatic life criteria were exceeded for iron and mercury in the Adit #1 discharge. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, and zinc, and chronic aquatic life criteria were exceeded for iron and mercury in the Adit #2 discharge. Adit discharge pH measurements were 2.3 and 3.6 for Adit #1 and Adit #2, respectively.
- Ontario Creek was flowing near the site and received the discharge from Adit #2. Observed releases to Ontario Creek were documented for copper and zinc in water samples, and arsenic, copper, lead and antimony in sediment samples; however, no MCLs or acute or chronic aquatic life criteria were exceeded in Ontario Creek that were attributable to the site. The upstream surface water sample indicated the presence of an upgradient contaminant source.
- A potentially hazardous collapsing building was observed at the site.

Ontario Millsite PA# 39-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/10/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-010-SE-1	851	26.7	1.8 J	8.5	2.9	60.7	8060	0.034 JX	544 J	4	337	18 J	150 J	NR
39-010-SE-2	3420	17.4	0.5 U	1.3 U	2.5	52.1	25000	0.114 JX	19.9 J	2	2080	128 J	273 J	NR
39-010-SE-4	12	26.7	0.6 U	8	1.8	9.3	8410	0.031 JX	269 J	3	12	4 UJ	62 J	NR
39-010-TP-1	1790	41.1	30.7 J	4	4	628	7560	0.085 JX	74.4 J	9	1410	61 J	2530 J	NR
39-010-TP-2	2730	8.5	13.8 J	1.2	1 U	178	6930	0.113 JX	22.2 J	2 U	1290	130 J	1770 J	NR
39-010-TP-5	1510	5.8	0.4 U	1 U	0.9	47.4	3550	0.093 JX	4.3 J	2 U	2090	55 J	76 J	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENTIAL	SULFUR POTENTIAL	ACID BASE %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR %	ACID BASE POTENTIAL	SULFUR POTENTIAL
39-010-TP-1	1.35	42.2	-6.1	-48	1.22	1.22	0.13	4.06	-10.2	-10.2
39-010-TP-2	0.52	16.2	-1.7	-18	0.35	0.35	0.05	1.56	-3.29	-3.29
39-010-TP-5	0.1	3.12	0.09	-3	0.03	0.03	<0.01	0	0.09	0.09

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)	HARDNESS CALC.
39-010-GW-1	1190	9.27	35	33	5 U	306	44300	0.053 J	2100	21.3	425 J	29.5	5310	82.1
39-010-GW-2	20.3	14.6	3.9	15.2	6	12.4	6420	0.11 J	1170	8.78 U	2.79 J	18.3 U	788	58.5
39-010-SW-1	5.4	6.27	2.55 U	5.99 U	5 U	5.67	177	0.093 J	44.4	8.78 U	5.5 J	18.3 U	75	8
39-010-SW-2	11.3	14	8.6	14.6	5 U	92	480	0.099 J	1160	8.78 U	153 J	18.3 U	1690	47
39-010-SW-4	2.87	6.73	2.55 U	5.99 U	5 U	1.35 U	198	0.1 J	8.1	8.78 U	2.7 J	18.3 U	7.4	7

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
39-010-GW-1	48	< 5.0	220	< 0.05	NR
39-010-GW-2	204	< 5.0	92	0.05	NR
39-010-SW-1	302	< 5.0	10	< 0.05	NR
39-010-SW-2	186	< 5.0	83	< 0.05	NR
39-010-SW-4	46	< 5.0	8	< 0.05	NR

LEGEND

- SE1 - Downgradient of TP5 & majority of streambank tailings on Ontario Creek
- SE2 - Downgradient of furthest downgradient tailings impoundment (TP4).
- SE4 - Upstream of confluence with tailings in Ontario Creek.
- TP1 - Composite of subsamples TP 1B, 2AC, and 4AD.
- TP2 - Composite of subsamples TP1A, 2AA, 2AB, and 4AA through 4AC.
- TP5 - Grab of subsample TP5A.
- BACKGROUND - From the Ontario Millsite (39-010-S3-1).
- GW1 - Adit furthest North, by waste rock dump 1.
- GW2 - Adit furthest South, by waste rock dump 2.
- SW1 - Same as sample SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Golden Anchor</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>7W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 1</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 28' 20"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 25' 27"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Little Blackfoot River</u>
Quad: <u>Bison Mountain</u>	Date Investigated: <u>July 14, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>39-012</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 5000 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 3.1J mg/kg                      Antimony: 29J mg/kg  
Zinc: 329J mg/kg.
- The waste rock dumps were mostly unvegetated.
- A discharging adit, sampled as GW-1, was present, with a flow of approximately 1.4 gpm, a pH of 6.85, and a specific conductance of 188.7 umhos/cm. The adit discharge exceeded the MCL for arsenic, the acute aquatic life criteria for zinc and the chronic aquatic life criteria for iron, mercury, and zinc.
- An unnamed tributary to the Little Blackfoot River flowed past the northern boundary of the site. There were no observed releases, MCL/MCLG or aquatic life criteria exceedances attributable to this site. Samples were collected during a storm event which visibly intensified between the downstream and upstream sample collection. This storm event may be partially responsible for inconclusive results generated by this sampling.
- Two highwalls were present and classified as hazardous; one approximately 25 feet high and associated with collapsed Adit #1, and the second approximately one half mile above the adit in an exploration cut that was about 50 feet high. A metal building in poor repair was also classified as potentially hazardous.

Golden Anchor PA# 39-012  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/14/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-012-SE-1	247 J	69	6.6 J	19.2	1.7	8.6 JX	12200	0.084 J	1910	3 UJX	137 J	7 J	643 J	NR
39-012-SE-2	697 J	69.7	7 J	12.8	2.7	19.4 JX	20800	0.131 J	1200	4 UJX	454 J	12 J	726 J	NR
39-012-WR-1	323 J	379	3.1 J	3.3	3.9	17.2 JX	13500	0.074 J	310	2 UJX	80 J	29 J	329 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		POTENT. V/1000
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	
39-012-WR-1	2.84	88.7	52.6	-36	1	1.3	0.54	40.6	12								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-012-GW-1	61.6	10.40	2.57 U	9.70 U	6.83 U	1.55 U	3610	0.260	953 J	12.7 U	1.42 J	30.7 U	208 J	80.9
39-012-SW-1	30.6	5.87	2.57 U	9.70 U	6.83 U	1.55 U	188	0.230	58.5 J	12.7 U	1.85 J	30.7 U	183 J	69
39-012-SW-2	27.9	6.77	2.57 U	9.70 U	6.83 U	23.10	154	0.094	18.4 J	12.7 U	2.19 J	30.7 U	152 J	65.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-012-GW-1	201	6.3	55	< 0.05	NR
39-012-SW-1	271	< 5.0	58	< 0.05	NR
39-012-SW-2	151	< 5.0	57	< 0.05	NR

LEGEND

SE1 - Downstream of waste rock dump 1.  
SE2 - Above access road to mine approx. 40'.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Charter Oak (39-003-SS-1).  
GW1 - At the mouth edit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Hard Luck</u>	County: <u>Powell</u>
Legal Description: <u>T 8N R 6W</u>	Section(s): <u>NW 1/4, SW 1/4, Sec. 21</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Ag, Zn, Pb, Cu, Au</u>
Latitude: <u>N 46° 25' 43"</u>	Primary Drainage: <u>Ontario Creek</u>
Longitude: <u>W 112° 22' 12"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Ontario Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>July 14, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>39-014</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 650 cubic yards. The following elements were elevated at least three times background:

Arsenic: 4290J to 3750J mg/kg	Cadmium: 6J mg/kg
Mercury: 0.061J to 0.391J mg/kg	Manganese: 26,500 mg/kg
Lead: 16,500 J mg/kg	Antimony: 15J to 314J mg/kg
Zinc: 492J mg/kg	
- One adit discharge was observed at the site during the investigation. The minor flow was discharged from the open adit through a 2-inch pipe around a waste dump, to a wooden bucket and eventually seeped into the ground. No MCLs were exceeded in the adit discharge; however, the acute aquatic life criteria for cadmium and the chronic aquatic life criteria for mercury were exceeded. No other surface water was observed in the vicinity of the site.
- Two potentially hazardous mine openings were observed during the investigation including one partially caved adit and one partially caved shaft, and a potentially hazardous collapsing building was located on the west side of the site.

Hard Luck PA# 39-014  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-014-WR-1	3750 J	16.7	6 J	9.6	1.9	13.3 JX	52400	0.061 J	26500	7 JX	151 J	15 J	492 J	NR
39-014-WR-2	4290 J	70.2	3.3 J	1.5 U	1.1 U	55.1 JX	17300	0.391 J	8.1	2 UJX	16500 J	314 J	97 J	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		POTENT. v/1000
	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	%	v/1000	
39-014-WR-1	1.6	50	119	69.3	0.44	69.3	0.29	0.87	27.2	0.31	0.03	0.03	0.038 U	0.038 U	4.08 U	0.72 U	92.1
39-014-WR-2	0.76	23.7	-0.3	-24	0.72	-24	0.03	0.01	0.31	0.31	0.03	0.03	0.038 U	0.038 U	4.08 U	0.72 U	-0.65

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-014-GW-1	31.7 J	2.01 U	2.57 U	9.70 U	6.83 U	1.55 U	23.7	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	62.8

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-014-GW-1	116	< 5.0	24	< 0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR2A and 2B.  
BACKGROUND - From the Ontario Millsite (39-010-SS-1).

GW1 - Airt discharge.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Kimball</u>	County: <u>Powell</u>
Legal Description: <u>T 8N R 7W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 12</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Pb, Ag, Au, Zn, Cu</u>
Latitude: <u>N46° 27' 49"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 25' 04"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Little Blackfoot River</u>
Quad: <u>Bison Mountain</u>	Date Investigated: <u>August 18, 1993</u>
Inspectors: <u>Bullock, Belanger/Pierson</u>	P.A. # <u>39-018</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 6500 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 2350J mg/kg                      Cadmium: 5.6 mg/kg  
Antimony: 97.6 mg/kg                      Zinc: 385J mg/kg  
Lead: 901J mg/kg
- The waste rock was 90% unvegetated.
- No discharging adits, seeps, or springs were observed during the investigation.
- No surface water samples were collected due to an absence of direct runoff pathways to the nearest surface water.
- The adit associated with Waste Rock 3 had a culvert closure installed by the MDSL.
- An old loadout present on the site was classified as a potential hazardous structure.

Kimball PA# 39-018  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BULLOCK  
 INVESTIGATION DATE: 08/18/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-018-WR-1	2350 J	66.6 J	5.6	3.91	4.47	32.2 J	38600 J	0.064 J	412 J	2.64 U	901 J	97.6	385 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE v/1000x	SULFUR ACID BASE POTENT. v/1000x
39-018-WR-1	3.07	95.9	43.4	-53	0.65	2.09	0.33	65.3	-21.9

LEGEND

WR1 - Composite of subsamples WR1, 2A, 2B, and 3.  
 BACKGROUND - From Charter Oak Mine (39-003-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Sure Thing</u>	County: <u>Powell</u>
Legal Description: <u>T 8N R 6W</u>	Section(s): <u>NW 1/4, SE 1/4, Sec. 15</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 26' 23"</u>	Primary Drainage: <u>Telegraph Creek</u>
Longitude: <u>W 112° 19' 55"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>O'Keefe Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>June 28, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>39-020</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 7700 cubic yards. The following elements were elevated at least three times background:

Arsenic: 2810-4930 mg/kg	Cobalt: 57.3 mg/kg
Mercury : 0.149J-0.285J mg/kg	Nickel: 57 mg/kg
Copper: 129-248 mg/kg	Iron: 123,000 mg/kg
Antimony: 35J-42J mg/kg	Zinc: 556 mg/kg
- The waste rock dump(WR-2) had elevated radiation readings ranging from 0.15-0.7 mR/hr.
- One discharging adit had a small flow of 3 gpm. The discharge, sampled as GW-1, had a pH of 3.36, and a specific conductance of 990 umhos/cm. The sample exceeded MCL/MCLGs for antimony, arsenic, cadmium, and copper, exceeded aquatic life standards (chronic) for iron, cadmium, copper, lead, and zinc, and aquatic life standards (acute) for cadmium, copper, lead, and zinc.
- Seeps were located below the Sure Thing Mine site, associated with mine workings that were not originally inventoried under this PA number also had low pH's ranging from 3.71 to 5.34.
- The hazardous highwall associated with the collapsed adit was 20 feet high.

Sure Thing PA# 39-020  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-020-WR-1	2810	9.6	0.6 U	1.3 U	1.7	54.8	12000	0.149 J	16.5	2 U	3850	42 J	43	NR
39-020-WR-2	4460	11.7	0.5 U	57.3	1 U	129	123000	0.285 J	6.8	57	24000	35 J	166	NR
39-020-WR-3	4930	22.9	0.5 U	3.1	4.9	248	54100	0.18 J	151	3	1620	13 J	556	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL NEUTRAL POTENT. v/1000r	SULFUR ACID BASE POTENT. v/1000r	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE v/1000r	SULFUR ACID BASE POTENT. v/1000r
39-020-WR-1	0.47	14.7	-0.8	-15	0.18	0.13	4.06	-4.82
39-020-WR-2	17.7	554	-4.5	-558	7.72	7.92	247	-252
39-020-WR-3	1.54	48.1	-7.4	-56	0.25	0.05	1.56	-8.97

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-020-GW-1	1740	4.57	101 J	61.2 JX	7.8	1360	29400	0.038 U	12800	52.7	183	25.5	11000	114

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-020-GW-1	490	< 5.0	286	< 0.05	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Sample of the WR2A subsample.  
WR3 - Composite of the subsamples WR2B and 2C.  
BACKGROUND - From the Ontario Millite (39-010-SS-1).

GW1 - Discharge from adit #1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Julia</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>S 1/2, SW 1/4, Sec. 5</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Cu, Pb, Au, Ag</u>
Latitude: <u>N 46° 28' 00"</u>	Primary Drainage: <u>Telegraph Creek</u>
Longitude: <u>W 112° 22' 35"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Booth Gulch</u>
Quad: <u>Bison Mountain and Three Brothers</u>	Date Investigated: <u>June 28, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>39-022</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 10,720 cubic yards of uncovered waste rock on site. The following were elevated at least 3 times background:
  - Cadmium: 3.9 to 291 mg/kg
  - Copper: 108 to 155 mg/kg
  - Mercury: 1.37J to 5.12J mg/kg
  - Lead: 2,030 to 10,500 mg/kg
  - Antimony: 382J to 602J mg/kg
- There were no discharging adits at this site.
- There was no surface water on the site. The nearest surface water is 0.5 miles away.
- There was one open adit and two hazardous loadout structures on site.

Julia PA# 39-022  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-022-WR-1	106	17.8	3.9	2.3	1.2	108	25000	1.37 J	67.2	2 U	2030	382 J	458	NR
39-022-WR-2	136	5.8	291	8.6	1.1 U	155	90500	5.12 J	16.7	4	10500	602 J	27600	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	TOTAL	ACID BASE	POTENT.	ACID BASE	POTENT.	ACID BASE	SULFUR	%	SULFUR	ACID BASE	SULFUR	%	SULFUR	ACID BASE	SULFUR	ACID BASE	POTENT.	%
39-022-WR-1	1.77	55.3	-1.9	-57	1.24	0.41	0.12	3.75	217	0.41	0.12	3.75	217	0.41	0.12	3.75	217	0.41
39-022-WR-2	17.2	537	-3.5	-540	<0.01	6.96	10.9	-5.68	-221	10.9	6.96	10.9	217	217	10.9	217	217	10.9

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 3.  
WR2 - Sample from the WR2 subsample.  
BACKGROUND - From Charter Oak Mine (39-003-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Telegraph</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 11</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock, Placer/Au, Ag</u>
Latitude: <u>N 46° 27' 51"</u>	Primary Drainage: <u>Telegraph Creek</u>
Longitude: <u>W 112° 18' 51"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Bryan Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>June 10, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>39-023</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 1260 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 524J mg/kg                      Copper: 99.2 mg/kg  
Mercury: 0.147 to 0.506 mg/kg              Lead: 425 mg/kg
- The waste rock dumps were unvegetated.
- Two discharging adits were present, GW-1 had a flow of 5 gpm, a pH of 4.77, and specific conductance of 135.3 umhos/cm. The second adit (GW-2) had a flow of 8 gpm, a neutral pH of 6.53, and a low specific conductance of 36 umhos/cm. Both adit discharges empty into Bryan Creek below the site. One seep was also located between WR-3 and WR-4.
- The discharge flowed over the waste rock at the site and then into Bryan Creek south of the mine. An observed release of copper was documented in the surface water. MCL/MCLGs were not exceeded in Bryan Creek. Although, there were several aquatic life criteria exceedances in the Bryan Creek samples, none were directly attributed to this site.
- Two hazardous structures were present at the site, an old loadout or mill, and a cabin. There was a highwall present behind adit #1 and WR-1 was over-steepened and eroding into the adit discharge.

Telegraph PA# 39-023  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/10/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-023-SE-1	58 J	91.9	10.1	7.7	6.3	54.2	14300	0.217	2080	17 J	62	6 J	913	NR
39-023-SE-2	57 J	112	19.6	5.3	5.9	70.3	13000	0.131	3080	23 J	40	4 UJ	1840	NR
39-023-WR-1	208 J	48	0.4 UJ	1.3	4.3	48.9	25500	0.506	24.2	1 UJ	425	3 UJ	47	NR
39-023-WR-2	524 J	23.8	0.5 UJ	1.1 U	1.9	99.2	27500	0.147	24.1	2 UJ	58	8 J	133	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL		SULFUR ACID BASE POTENTIAL	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
39-023-WR-1	0.35	10.9	-0.1	-11	0.34	-11	0.01	0.01	<0.01	0	0.01	0	0	-0.05	-0.05	-0.05
39-023-WR-2	0.44	13.7	-4.1	-18	0.43	-18	0.01	0.01	<0.01	0	0.01	0	0	-4.14	-4.14	-4.14

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-023-SW-1	2.9	13.9	4.5	5.99 U	5 U	8.43	142	0.14	40.5	8.78 U	3.6	18.3 U	726	15.2
39-023-SW-2	1.49 U	14.4	4.07	5.99 U	5 U	4.57	107	0.1 J	62.2	8.78 U	2.39 J	18.3 U	1090	16.6
39-023-SW-3	2.84	16.3	2.55 U	5.99 U	5 U	34.2	166	0.11 J	103	8.78 U	6.17 J	18.3 U	76.8	13.3
39-023-SW-4	1.87	15.4	2.55 U	5.99 U	5 U	17.7	329	0.07 J	129	8.78 U	1.9 J	18.3 U	80.5	20

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-023-SW-1	55	< 5.0	19	0.07	NR
39-023-SW-2	54	< 5.0	18	0.06	NR
39-023-SW-3	69	< 5.0	28	< 0.05	NR
39-023-SW-4	72	< 5.0	26	< 0.05	NR

LEGEND

- SE1 - Bryan Creek downstream from edit discharge confluence.  
SE2 - Bryan Creek upstream from edit discharge and possible influence from waste rock dump 2.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Sample of the WR2 subsample.  
BACKGROUND - From the Ontario Millsite (39-010-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Addit discharge below waste rock dump 1.  
SW4 - Confluence of seeps in edit #1 area on the N. side of the road.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Third Term</u>	County: <u>Powell</u>
Legal Description: <u>T 9N R 6W</u>	Section(s): <u>NE 1/4, SE 1/4, Sec. 28</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Zn, Cu, Pb, Au, Ag</u>
Latitude: <u>N 46° 30' 08"</u>	Primary Drainage: <u>Little Blackfoot</u>
Longitude: <u>W 112° 21' 09"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Flume Creek</u>
Quad: <u>Mac Donald Pass</u>	Date Investigated: <u>July 14, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>39-024</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with the site was estimated to be approximately 2,700 cubic yards. The dumps were previously reclaimed. The following elements were elevated at least three times background:  
Copper: 116JX mg/kg                      Lead: 200J mg/kg
- There were no adit discharges, filled shafts, seeps, or springs observed at the site during the investigation.
- Little Flume Gulch flowed from east to west approximately eight feet south of the toe of WR-1. No MCLs were exceeded in Little Flume Gulch in either the upstream or downstream water samples; however, the chronic aquatic life criteria for mercury and lead were exceeded in both the upstream and downstream samples. The acute and chronic aquatic life criteria were exceeded for copper and zinc in the downstream sample.
- Observed releases to Little Flume Gulch were documented for copper and zinc. The aquatic life criteria exceedances for copper and zinc were directly attributed to the site.

Third Term PA# 39-024  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-024-SE-1	51 J	199	3.6 J	24.9	8.9	23.6 JX	25500	0.107 J	3680	9 JX	20 J	9 UJ	132 J	NR
39-024-SE-2	23 J	116	9.8 J	28.2	3.5	169 JX	11100	0.072 J	3300	11 JX	13 J	6 UJ	405 J	NR
39-024-WR-1	29 J	93.7	2.8 J	6.3	83.2	116 JX	28400	0.12 J	281	42 JX	200 J	10 J	128 J	NR
BACKGROUND	20 J	180	1.9 J	8.2	39.2	29 JX	15900	0.067 J	588	19 JX	28 J	6 UJ	123 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x	%	U/1000x
BACKGROUND	0.02	0.62	4.49	201	0.01	3.86	0.01	0.01	0.01	0.31	<0.01	5	0.21	4.18	196	
39-024-WR-1	0.9	28.1			0.53	173		0.16								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-024-SW-1	6.90	9.30	2.57 U	9.70 U	6.83 U	24.50	628	0.240	58.5 J	12.7 U	1.25 J	30.7 U	89.1 J	25.2
39-024-SW-2	6.11	14.30	2.57 U	9.70 U	6.83 U	1.67	598	0.210	32.5 J	12.7 U	1.22 J	30.7 U	7.57 U	24.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-024-SW-1	92	< 5.0	10	< 0.05	NR
39-024-SW-2	87	< 5.0	8	< 0.05	NR

LEGEND

SE1 - Downstream of dump in Little Flume Gulch.  
SE2 - Upstream from dump in Little Flume Gulch.  
WR1 - Composite of WR1A and 1B.  
BACKGROUND - West of subsample WR1B, From the Third Term (39-024-SW-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Anna R./Hattie M.</u>	County: <u>Powell</u>
Legal Description: <u>T 8N R 6W</u>	Section(s): <u>NE 1/4, NE 1/4, NW 1/4, Sec. 15</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 46° 27' 04"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 20' 27"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Telegraph Creek</u>
Quad: <u>Three Brothers</u>	Date Investigated: <u>June 28, 1993</u>
Inspectors: <u>Babits, Lasher/Pierson</u>	P.A. # <u>39-044</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- There were approximately 2,230 cubic yards of uncovered waste rock at the site. The following were elevated at least three times background:

Arsenic: 3,540 to 10,400 mg/kg	Cadmium: 5.9 mg/kg
Cobalt: 28.6 mg/kg	Copper: 167 to 343 mg/kg
Mercury: 0.195J to 0.721J mg/kg	Nickel: 37 mg/kg
Lead: 2,030 to 5,980 mg/kg	Antimony: 38J mg/kg
Zinc: 673 mg/kg	
- There was one discharging adit at the site, but it did not enter surface water directly. A sample of this discharge had a pH of 5.73, and the MCL/MCLG for cadmium was exceeded.
- There was no surface water on the site. The nearest surface water was 500 feet away.
- There was one open shaft, one hazardous loadout structure, and one collapsing cabin (mill) at the site.

Anna R./Hattie M. PA# 39-044  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-044-WR-1	3540	25.1	5.9	28.6	2.4	343	27000	0.721 J	5840	37	2030	14 J	673	NR
39-044-WR-2	10400	18.5	0.5 U	4.1	1 U	167	54900	0.195 J	63.3	4	5980	38 J	272	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
39-044-WR-1	0.57	17.8	1.37	-11	0.36	-16	0.05	0.16	0.16	0.58	0.038 U	1.56	-0.19	-48.8
39-044-WR-2	2.53	79	-11	-90	0.73	-90	1.22	0.58	0.58					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-044-SW-1	40.2	2.67	6.93 J	11.9 JX	5 U	64	1390	0.038 U	630	10.4	12.5	18.3 U	810	57.3

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-044-SW-1	145	< 5.0	49	0.15	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 3B.  
WR2 - Composite of subsamples WR2A, 2B, and 3A.  
BACKGROUND - From Ontario Millsite (39-010-SS-1).

SW1 - Acid discharge from waste rock dump 1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Mountain View</u>	County: <u>Powell</u>
Legal Description: T <u>8N</u> R <u>6W</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 6</u>
Mining District: <u>Elliston</u>	Mine Type: <u>Hardrock/Pb, Ag, Au</u>
Latitude: <u>N 46° 28' 26"</u>	Primary Drainage: <u>Little Blackfoot River</u>
Longitude: <u>W 112° 24' 20"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Unnamed Tributary</u>
Quad: <u>Bison Mountain</u>	Date Investigated: <u>July 14, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>39-062</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no tailings directly associated with this site. Approximately 10 cubic yards of tailings were found to be associated with a mine west of the Mountain View.
- The volume of waste rock associated with this site was estimated to be 6500 cubic yards. The following elements were elevated at least three times background:

Arsenic: 706J mg/kg	Cadmium: 12.4J mg/kg
Mercury: 0.177J mg/kg	Antimony: 41J mg/kg
Lead: 687J mg/kg	Zinc: 1870J mg/kg
- The waste rock dumps were mostly unvegetated.
- The adit associated with Waste Rock 1, sampled as GW-1, was discharging at approximately 5 gpm, had a pH of 6.81, and a specific conductance of 2050 umhos/cm. This sample exceeded the MCL/MCLGs for arsenic, and antimony, as well as the acute aquatic life criteria for zinc and the chronic aquatic life criteria for iron, and zinc.
- A seep at the toe of WR-1 was the start of the flow in the unnamed tributary to the Little Blackfoot River. This seep had a pH of 6.68 and a specific conductance of 205 umhos/cm.
- The unnamed tributary was sampled as SW-1 below Waste Rock 2. The stream had a flow rate of approximately 30 gpm, a pH of 6.87, and a specific conductance of 187.8 umhos/cm. This sample exceeded the MCL for arsenic, as well as the acute aquatic life criteria for cadmium and zinc, and the chronic aquatic life criteria for cadmium, lead, and zinc. Arsenic, cadmium, copper, mercury, lead, antimony and zinc were detected in the stream sediment sample collected at this location higher than three times background for the area.
- The discharging adit at WR-1 was open and classified as potentially hazardous. Water was ponded behind a berm pushed up in front of the adit opening.

Mountain View PA# 39-062  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-062-SE-1	430 J	105	74.4 J	16.8	3.8	194 JX	75800	0.195 J	2400	5 UJX	1700 J	49 J	11500 J	NR
39-062-WR-1	706 J	31	12.4 J	9.8	3	46.2 JX	28300	0.177 J	1130	3 JX	687 J	41 J	1870 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		HARDNESS CALC.
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	
39-062-WR-1	2.97	92.8	52.9	-40	0.98	1.24	0.75	38.7	14.2								

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.
39-062-GW-1	149 J	9.57	2.57 U	9.70 U	6.83 U	1.55 U	1680	0.038 U	928	12.7 U	1.37 J	31.1	132	111
39-062-SW-1	92.6 J	5.10	4.70 J	9.70 U	6.83 U	1.55 U	190	0.038 U	23.1	12.7 U	4.31 J	30.7 U	931	116

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-062-GW-1	222	< 5.0	58	< 0.05	NR
39-062-SW-1	204	< 5.0	65	< 0.05	NR

LEGEND

SE1 - Just downstream of waste rock dump 2.  
WR1 - Composite of subsamples WR1A, 1B, 2A, and 2B.  
BACKGROUND - From the Charter Oak Mine (39-003-SS-1).

GW1 - At the mouth of edit #1.  
SW1 - Same as sample SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Emery</u>	County: <u>Powell</u>
Legal Description: <u>T 7N R 8W</u>	Section(s): <u>Sec. 10 and Sec. 11</u>
Mining District: <u>Emery/Zosell</u>	Mine Type: <u>Hardrock/Au, Ag, Pb, Zn</u>
Latitude: <u>N 46° 22' 30"</u>	Primary Drainage: <u>Cottonwood</u>
Longitude: <u>W 112° 35' 00"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Rocker Gulch</u>
Quad: <u>Baggs Creek/Sugarloaf Mountain</u>	Date Investigated: <u>July 6, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>39-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings associated with this site was estimated to be approximately 21,400 cubic yards. The following elements were elevated at least three times background:

Arsenic: 6480J mg/kg	Cadmium: 17.1 mg/kg
Copper: 226J mg/kg	Lead: 1560 mg/kg
Antimony: 65J mg/kg	Zinc: 2070 JX mg/kg
  
- The volume of waste rock associated with this site was estimated to be approximately 244,625 cubic yards (over 12 waste rock dumps were observed). The following elements were elevated at least three times background:

Arsenic: 3630J to 12,900J mg/kg	Cadmium: 34 to 87.2 mg/kg
Copper: 3131J to 472J mg/kg	Mercury: 0.785 to 1.56 mg/kg
Manganese: 8080J mg/kg	Nickel: 29J to 81J mg/kg
Lead: 1970 to 9230 mg/kg	Antimony: 32J to 564J mg/kg
Zinc: 2070JX to 9910JX mg/kg	
  
- This site was situated on both sides and between two flowing streams: Rocker Gulch and North Fork Rocker Gulch. North Fork Rocker Gulch intersected the site from the north and disappeared into the ground before reaching the tailings ponds located in the center of the site. Rocker Gulch intersected the site from the northeast and disappeared into the ground on the north side of the tailings ponds. Rocker Gulch reappeared farther south on the south side of WR-9. No MCLs were exceeded in upstream samples collected from either stream; however, acute aquatic life criteria for cadmium and chronic aquatic life criteria were exceeded for cadmium and lead in North Fork Rocker Gulch. Chronic aquatic life criteria were exceeded for cadmium and mercury in Rocker Gulch. The MCL for arsenic and chronic aquatic life criteria were exceeded for cadmium and mercury in the downstream Rocker Gulch sample.
  
- Observed releases to Rocker Gulch were documented for arsenic, mercury, lead, and zinc.
  
- Three potentially hazardous mine openings including two shafts and one adit were observed during the investigation.

Emery PA# 39-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/16/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-004-SE-1	318	49.5	5.7	15.8	39.5	28.6	38500	0.151	970	18	645	6 UJ	957	NR
39-004-SE-2	157	110	2.9	17.1	32.1	26.1	45400	0.15	1210	8	141	8 UJ	247	NR
39-004-SE-3	454	77.2	5.5	20.2	43.7	29.5	47700	0.182	1010	14	303	7 UJ	1020	NR
39-004-SE-4	390 J	159 J	7	42.7 JX	60.3 JX	64.4 J	89900 J	0.457	2540 J	46 J	462	19 UJ	620 JX	NR
39-004-TP-1	6480 J	39.1 J	17.1	12.5 JX	29.3 JX	226 J	43000 J	0.363	3030 J	19 J	1560	65 J	2070 JX	NR
39-004-WR-1	12900 J	162 J	87.2	23.8 JX	14.5 JX	472 J	81600 J	1.56	8080 J	29 J	9230	564 J	9910 JX	NR
39-004-WR-2	6080 J	14.5 J	34	20.1 JX	33.5 JX	175 J	61300 J	1.14	3780 J	81 J	5980	32 J	2070 JX	NR
39-004-WR-3	3630 J	477 J	56.3	21.2 JX	27.6 JX	313 J	45300 J	0.785	11600 J	13 J	1970	126 J	4490 JX	NR
BACKGROUND	91	295	3.5	13.9	36.9	67.3	43400	0.165	2960	7	43	7 UJ	171	NR

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR		POTENT.	
	SULFUR %	ACID BASE v/1000x	NEUTRAL POTENT. v/1000x	ACID BASE POTENT. v/1000x	SULFATE SULFUR %	PYRITIC SULFUR %	SULFUR %	SULFUR %	ACID BASE v/1000x	SULFUR v/1000x	ACID BASE v/1000x	POTENT. v/1000x		
39-004-TP-1	1.44	45	90.6	45.6	<0.01	1.24	0.27	38.7	51.9					
39-004-WR-1	4.5	141	51	-90	0.86	2.1	1.54	65.6	-14.6					
39-004-WR-2	2.34	73.1	94.3	21.2	0.77	0.98	0.59	30.6	63.7					
39-004-WR-3	3.04	95	124	28.6	0.7	1.44	0.9	45	78.6					

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC. (mg CaCO3/L)
39-004-SW-1	15.5	7.43	3.63 J	9.7 U	6.83 U	1.6	152	0.038 U	13.1	12.7 U	10.7	30.7 U	54.5	70.6
39-004-SW-2	12.6	8.73	3.13 J	9.7 U	6.83 U	1.55 U	411	0.038 U	29	12.7 U	2.88	30.7 U	7.57 U	42.7
39-004-SW-3	92.4	11.2	3.9 J	9.7 U	6.83 U	1.55 U	152	0.250	11.9	12.7 U	6.76	30.7 U	32.3	214
39-004-SW-4	8.61	10	2.6 J	9.7 U	6.83 U	1.55 U	21.7	0.052	4.08 U	12.7 U	1.61	30.7 U	7.57 U	111

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-004-SW-1	123	< 5.0	21	< 0.05	NR
39-004-SW-2	83	< 5.0	12	< 0.05	NR
39-004-SW-3	305	< 5.0	114	< 0.05	NR
39-004-SW-4	179	< 5.0	46	< 0.05	NR

LEGEND

SE1 - Downstream N. Fork Rocker Gulch.  
SE2 - Upstream N. Fork Rocker Gulch.  
SE3 - Downstream Rocker Gulch.  
SE4 - Upstream Rocker Gulch.  
TP1 - Composite of subsamples TP1a, 1B, 2, 3, and 4.  
WR1 - Composite of subsamples WR1A, 1B, 2, and 3.  
WR2 - Composite of subsamples WR2A, 4B, 5, 6, 7, and 8.  
WR3 - Composite of subsamples WR3A, 9B, 10A, 10B, 12A, and 12B.

BACKGROUND - From the Emery Mine (39-004-SS-1).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.  
SW4 - Same as sample SE4.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Curlew</u> Legal Description: T <u>Mn</u> R <u>W</u> Mining District: <u>Curlew</u> Latitude: <u>N 46° 27' 49"</u> Longitude: <u>W 114° 10' 45"</u> Land Status: <u>Private</u> Quad: <u>Victor</u> Inspectors: <u>Bullock, Tuesday</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Ravalli</u> Section(s): <u>NE 1/4, NE 1/4, Sec. 14</u> Mine Type: <u>Hardrock/Au, Ag, Pb, Cu, Zn</u> Primary Drainage: <u>Battered River</u> USGS Code: <u>17010205</u> Secondary Drainage: <u>Big Creek</u> Date Investigated: <u>September 9, 1993</u> P.A. # <u>41-003</u>
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- An estimated 41,000 cubic yards of tailings were present on the site. The tailings were about 60% unvegetated at the time of this investigation. The following elements were elevated at least three times background:

Arsenic: 1640-3160 mg/kg  
Copper: 286-749 mg/kg  
Manganese: 29,600-32,000 mg/kg  
Lead: 3140-4450 mg/kg  
Zinc: 18,300-20,300 mg/kg

Cadmium: 39.6-47.5 mg/kg  
Iron: 74,900-76,100 mg/kg  
Nickel: 31.8-33.3 mg/kg  
Antimony: 27J-33.1J mg/kg

- The volume of waste rock associated with this site was estimated to be 82,110 cubic yards. The following elements were elevated at least three times background:

Arsenic: 48.3-692 mg/kg  
Lead: 509 mg/kg  
Zinc: 1930 mg/kg

Mercury: 0.439J mg/kg  
Manganese: 8790 mg/kg

- The waste rock was mostly unvegetated.

- No discharging adits, seeps or springs were observed on site.

- A large pond was present in the glory hole, with a moderately high pH of 8.71. No exceedances of MCL/MCLGs or aquatic life criteria were documented, with the exception of the chronic aquatic life criteria for mercury.

- Two irrigation ditches that were flowing, at the time of this investigation, bisected the site. No samples were collected due to lack of runoff from the site. Spring runoff sampling was recommended for this site.

- The north end of TP-1 had recently been used for a household garbage disposal area.

- Two open adits, two structures, and the highwall associated with the glory hole were classified as potential hazards.

**Curlew PA# 41-003**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 09/09/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
41-003-TP-1	3160	6.12	47.5	2.21	5.77	749	76100	0.163 J	29600	31.8	4450	33.1 J	20300	NR
41-003-TP-2	1640	10.5	39.6	2.89	5.66	286	74900	0.069 J	32000	33.3	3140	27 J	18300	NR
41-003-WR-1	692	53.4	1.3	4.65	4.91	11.8	27600	0.091 J	8790	16	509	4.74 UJ	1930	NR
41-003-WR-2	48.3	1000	0.9 U	2.39	3.52	13	31200	0.439 J	508	8.33	32.7	5.94 UJ	86.8	NR
BACKGROUND	5.04 U	357 J	0.6 U	8.34 J	8.69	5.95 J	10700	0.144	2320 J	7.66	18.4	6.56 UJ	58.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE /1000x	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
41-003-TP-1	1.07	33.4	81	47.6	0.53	0.59	18.4	62.6
41-003-TP-2	0.61	19.1	121	102	0.4	0.25	7.81	113
41-003-WR-1	0.27	8.43	145	136	0.14	0.1	3.12	141
41-003-WR-2	0.59	18.4	259	240	0.5	0.05	1.56	257

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
41-003-SW-1	7.18 JX	17.8	2.57 U	9.7 U	6.83 U	1.55 U	27.9	0.13	35.8	16	3.82	30.7 UJ	47.5	528

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
41-003-SW-1	835	< 5.0	560	< 0.05	NR

**LEGEND**

TP1 - Composite of subsamples TP1A, 1B, 1C-A, 1C-B, and 1C-C. SW1 - Pond in bottom of Glory Hole.

TP2 - Composite of subsamples TP2A, 2B-A, and 2B-C.

WR1 - Composite of subsamples WR1A, B, 2, 3A, and 3B.

WR2 - Composite of subsamples WR4A, 4B, 5A, 5B, 6A, and 6B.

BACKGROUND - From the Mill Creek Mine (32-049-SS-1).



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Montana Prince</u>	County: <u>Ravalli</u>
Legal Description: <u>T 3N R 17W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 14</u>
Mining District: <u>Frog Pond Basin</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 46° 00' 51"</u>	Primary Drainage: <u>Moose Creek</u>
Longitude: <u>W 113° 40' 55"</u>	USGS Code: <u>17010205</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Cuba Creek</u>
Quad: <u>Whetstone Ridge</u>	Date Investigated: <u>June 22, 1993</u>
Inspectors: <u>Flammang, Clark</u>	P.A. # <u>41-004</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There are no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be approximately 3000 cubic yards. The following elements were elevated at least three times background:

Cadmium: 5.7 mg/kg	Copper: 41.6 mg/kg
Mercury: 0.829JX mg/kg	Manganese: 1220 mg/kg
Lead: 267 mg/kg	Zinc: 292 mg/kg
- There was one adit discharge associated with this site. The discharge flow rate was approximately 1 gpm, the pH was 7.54, and the specific conductance was 120 umhos/cm. The discharge did not exceed any of the applicable MCL/MCLGs or aquatic life criteria. The discharge seeped into the dump near the adit and then reappeared below the waste rock dump.
- This seep constituted the headwater of a small tributary to Cuba Creek. The manganese concentration measured in the seep was elevated greater than three times the adit discharge concentration, constituting the only observed release. The seep did not exceed any of the applicable MCL/MCLGs or aquatic life criteria.

Montana Prince PA# 41-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/22/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
41-004-SE-1	6 J	65.1	5.7	4.4	2.3	16.7	4380	0.726 JX	829	6	19	3 UJ	278	NR
41-004-WR-1	7 J	146	5.7	9.3	5.5	41.6	20900	0.829 JX	1220	12	267	4 UJ	292	NR
BACKGROUND	11 J	267	1.7	11	8.7	7.8	12800	0.08 JX	250	9	15	5 UJ	62	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	POTENT. 1/1000	
41-004-WB-1	1.24	38.7	46.7	7.92	0.27	0.41	0.56	12.8	33.8					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
41-004-GW-1	0.98 U	22.3	2.57 U	9.7 U	6.83 U	1.97	25.5	0.038 U	4.5	12.7 U	0.38 U	30.7 U	7.57 U	44.4
41-004-SW-1	0.98 U	18	2.57 U	9.7 U	6.83 U	2.03	43.3	0.038 U	23.3	12.7 U	0.38 U	30.7 U	13.2	44.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
41-004-GW-1	88 <	5.0	5	< 0.05	NR
41-004-SW-1	82 <	5.0	6	< 0.05	NR

LEGEND

SE1 - 10 feet below toe of waste rock dump 1.

WR1 - Composite of subsamples WR1A and 1B.

BACKGROUND - From the Montana Prince (41-004-SS-1).

GW1 - Water seeping from collapsed adit.

SW1 - Same as sample SE1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Bluebird</u>	County: <u>Ravalli</u>
Legal Description: T <u>7N</u> R <u>21W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 4</u>
Mining District: <u>Pleasant View</u>	Mine Type: <u>Hardrock/Ag. Cu</u>
Latitude: <u>N 46° 23' 24"</u>	Primary Drainage: <u>Bitterroot River</u>
Longitude: <u>W 114° 13' 53"</u>	USGS Code: <u>17010205</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Bear Creek</u>
Quad: <u>Victor</u>	Date Investigated: <u>September 8, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>41-009</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 2140 cubic yards. The following elements were elevated at least three times background:  
Copper: 117 mg/kg                      Mercury: 1.43J mg/kg  
Lead: 64.9 mg/kg
- The waste rock was mostly unvegetated.
- One adit at the site appeared to have had an occasional discharge. It was not, however, discharging at the time of the investigation. A small seep or precipitation puddle was present at the north end of WR-4.
- A intermittent tributary to Bear Creek was present along the south side of the site, This tributary was dry at the time of this investigation. Stream sediment samples collected in this drainage documented an observed release for mercury.
- Shafts were open and classified as hazardous at WR-2 and WR-4. The shaft at WR-2 had been used for illegal household garbage disposal. The highwall in the borrow pit area was approximately 40 feet high.

Blue Bird PA# 41-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/08/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
41-009-SE-1	14.7 J	138	0.6 U	9.31	7.29	35	24300	0.41 J	1550	5.03	48.5	6.61 UJ	157 J	NR
41-009-SE-2	12.8 J	160	0.6 U	6.1	3.76	20.6	14100	0.034 U	1700	3.6	21.8	7.24 UJ	203 J	NR
41-009-WR-1	7.28 J	24.2	0.6	1.94 U	1.37 U	117	6890	1.43 J	237	2.53 U	64.9	6.13 UJ	102 J	NR
BACKGROUND	5.04 U	357 J	0.6 U	8.34 J	8.69	5.95 J	10700	0.144	2320 J	7.66	18.4	6.56 UJ	58.9	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000	NEUTRAL POTENT. v/1000	SULFUR POTENT. v/1000	ACID BASE POTENT. v/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR v/1000	SULFUR ACID BASE POTENT. v/1000
41-009-WR-1	0.21	6.56	12.6	6.05	0.1	0.02	0.09	0.62	12

LEGEND

SE1 - Downgradient sediment sample in intermittent drainage.  
SE2 - Upgradient sediment sample in intermittent drainage.  
WR1 - Composite of subsamples WR2, 3, and 4.  
BACKGROUND - From the Mill Creek Mine (32-049-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Broken Hill</u>	County: <u>Sanders</u>
Legal Description: T <u>27N</u> R <u>34W</u>	Section(s): <u>SW 1/4, SW, 1/4, NE 1/4, Sec. 10</u>
Mining District: <u>Blue Creek</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 48° 07' 15"</u>	Primary Drainage: <u>East Fork Blue Creek</u>
Longitude: <u>W 115° 58' 06"</u>	USGS Code: <u>17010213</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>East Fork Blue Creek</u>
Quad: <u>Heron</u>	Date Investigated: <u>August 3, 1993</u>
Inspectors: <u>Bullock, Flammang, Clark</u>	P.A. # <u>45-005</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 6200 cubic yards. The following elements were elevated at least three times background:

Arsenic: 508 to 1140 mg/kg	Mercury: 2.53J to 27.2J mg/kg.
Cadmium: 15.2 to 26 mg/kg	Lead: 18,700J to 55,900J mg/kg
Copper: 140J to 342J mg/kg	Antimony: 61.3 to 344 mg/kg
Iron: 94,400 mg/kg	Zinc: 9600 to 11,400 mg/kg.
- The waste rock dumps were mostly unvegetated.
- A collapsed discharging adit (GW-1) was present, with a flow of approximately 25 gpm, a pH of 8.71, and a specific conductance of 75 umhos/cm. The adit discharge did not exceed any MCL/MCLGs. Chronic aquatic life criteria for mercury, lead and zinc and acute aquatic life criteria for lead and zinc were exceeded in this sample of the discharge.
- A dry tributary to the East Fork of Dry Creek was approximately 100 feet north of the site. There were no direct runoff pathways to surface water identified during this investigation. Therefore, surface water and stream sediment samples were not collected.
- One plastic barrel half full of an unknown material was present at the base of WR-1.

Broken Hill PA# 45-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-BULLOCK  
INVESTIGATION DATE: 08/03/83

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
45-005-WR-1	1140	27.9	15.2	7.25	5.25	342 J	94400	27.2 J	992	3.84	55900 J	344	9600	NR
45-005-WR-2	508	19.8	26	5.86	4.5	140 J	44200	2.53 J	426	6.23	18700 J	61.3	11400	NR
BACKGROUND	8.68	142	0.6 U	10.4	10.5	21.2 J	22100	0.06 J	710	14.4	33.8 J	6.84 U	78.2	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		SULFUR ACID BASE		PYRITIC SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE		SULFUR ACID BASE	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
45-005-WR-1	2.80	87.5	-5.78	-93.3	1.86	-93.3	0.08	2.50	0.86	2.50	0.86	0.86	0.044 J	0.044 J	0.044 J	0.044 J	0.044 J	0.044 J
45-005-WR-2	2.46	76.9	-4.12	-81.0	0.59	-81.0	0.15	4.69	1.72	4.69	1.72	1.72						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.
45-005-GW-1	30.4	2.01 U	2.57 U	9.7 U	6.83 U	2.97	69.6	0.044 J	15.2	12.7 U	107	30.7 U	867	23.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
45-005-GW-1	52	6.7	< 5	< 0.05	NR

LEGEND

GW1 - From the flow out of adit #2.

WR1 - Composite of subsamples WR1A, 1B, 1C, and 3.

WR2 - Composite of subsamples WR2A and 2B.

BACKGROUND - From the Holliday Mine (45-009-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Montro Gold</u>	County: <u>Sanders</u>
Legal Description: T <u>19N</u> R <u>26W</u>	Section(s): <u>SW 1/4, NW 1/4, Sec. 3</u>
Mining District: <u>Plains</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 47° 26' 08"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 54' 00"</u>	USGS Code: <u>17010213</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Combest Creek</u>
Quad: <u>Plains</u>	Date Investigated: <u>August 6, 1993</u>
Inspectors: <u>Bullock, Clark</u>	P.A. # <u>45-010</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 6300 cubic yards. The following elements were elevated at least three times background:  
Copper: 125J to 345J mg/kg                      Iron: 41,000 mg/kg  
Mercury: 0.306 to 1.51 mg/kg                      Lead: 4280 to 27,500 mg/kg  
Antimony: 28 mg/kg.
- The waste rock dump was 90% unvegetated.
- A collapsed discharging adit (GW-1) was present, with a low flow of approximately 2-3 gpm, a pH of 8.36, and a specific conductance of 250 umhos/cm. The adit discharge did not exceed MCL/MCLGs, but chronic aquatic life criteria for mercury, cadmium, and lead were exceeded.
- Residents downgradient from this site were apparently on a community water supply.
- There were no surface water expressions associated with this site.
- One adit was open with a gate and was classified as a potentially hazardous mine opening.

Montro Gold PA# 45-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/06/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
45-010-WR-1	6 J	43.7	1.3	22.7	7.2	125 J	34400	1.51	733 J	18	4280	5 UJ	57	NR
45-010-WR-2	7 J	30	1.7	13.1	4.3	345 J	41000	0.306	492 J	9	27500	28	17	NR
BACKGROUND	4.44 U	234	1.06	8.15	7.26	8.33	12900	0.037	987	9.72	21.3	5.79 U	95.2	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000	ACID BASE 1/1000	POTENT. 1/1000	ACID BASE 1/1000	SULFUR %	SULFATE %	SULFUR %	ACID BASE 1/1000	SULFUR %	ACID BASE 1/1000	SULFUR 1/1000	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000
45-010-WR-1DUP	0.05	1.56	1.56	4.38	4.38	2.82	2.82	0.03	<0.01	0.02	0.02	0.00	0.02	0.02	0.00	0.31	4.38	4.38
45-010-WR-1	0.06	1.87	1.87	4.42	4.42	2.54	2.54	0.03	0.01	0.02	0.01	0.31	0.02	0.02	0.31	4.11	4.11	4.11
45-010-WR-2	0.21	6.56	6.56	2.15	2.15	-4.41	-4.41	0.19	0.01	0.01	0.01	0.31	0.01	0.01	0.31	1.84	1.84	1.84

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
45-010-GW-1	2.92 J	25.7	2.57	9.7 U	6.83 U	5.13	585 J	0.230 JX	53.2	12.7 U	23.2 J	30.7 U	13.8 J	78

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
45-010-GW-1	141	6.7	11	0.37	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 2A.

WR2 - Sample of the WR2B subsample.

BACKGROUND - From the Montro Gold Mine (45-010-SS-1).

WR1DUP - Duplicate of the sample 45-010-WR-1.

GW1 - Lower edit discharge.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Lower Letterman</u>	County: <u>Sanders</u>
Legal Description: T <u>19N</u> R <u>26W</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 3</u>
Mining District: <u>Plains</u>	Mine Type: <u>Hardrock/Ag. Ag. Pb</u>
Latitude: <u>N 47° 25' 43"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 53' 37"</u>	USGS Code: <u>17010213</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Combest Creek</u>
Quad: <u>Plains</u>	Date Investigated: <u>August 6, 1993</u>
Inspectors: <u>Bullock, Clark</u>	P.A. # <u>45-047</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were associated with this site.
- The volume of waste material at the site was estimated to be 423 cubic yards. The following elements were elevated at least three times background:  
Mercury: 0.543 mg/kg  
Lead: 2600 mg/kg
- The waste rock dumps were approximately 75% unvegetated.
- No discharging adits, seeps, or springs were observed during this investigation.
- Water present in the southern stope had a fairly neutral pH of 6.40, and a low specific conductance of 90 umhos/cm. This water appeared to be ponded precipitation
- The nearest surface water expression was Combest Creek approximately 400 feet from the site, Combest Creek was dry at the time of this investigation.
- There were two hazardous stopes present at the Lower Letterman and a hazardous open adit was present. The open adit was approximately 1/4 mile north of the site.

Lower Letterman PA# 45-047  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BULLOCK  
 INVESTIGATION DATE: 08/06/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
45-047-WR-1	4 U	42.4	1.5	9.3	5.9	19.3 J	24800	0.543	2510 J	16	2600	5 UJ	47	NR
BACKGROUND	4.44 U	234	1.06	8.15	7.26	8.33	12900	0.037	987	9.72	21.3	5.79 U	95.2	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE % v/1000x	NEUTRAL POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x	SULFATE SULFUR % v/1000x	PYRITIC SULFUR % v/1000x	ORGANIC SULFUR % v/1000x	PYRITIC SULFUR ACID BASE POTENT. v/1000x	SULFUR ACID BASE POTENT. v/1000x
45-047-WR-1	0.01	0.31	8.55	8.24	0.01	<0.01	<0.01	0.00	8.55

LEGEND

WR1 - Composite of subsamples WR1 and 2.  
 BACKGROUND - From the Montro Gold Mine (45-010-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Holliday</u>	County: <u>Sanders</u>
Legal Description: T <u>26N</u> R <u>34W</u>	Section(s): <u>SE 1/4, NE 1/4, Sec. 36</u>
Mining District: <u>Trout Creek</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 47° 58' 30"</u>	Primary Drainage: <u>Pilgrim Creek</u>
Longitude: <u>W 115° 54' 40"</u>	USGS Code: <u>17010213</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>West Fork Pilgrim Creek</u>
Quad: <u>Gem Peak</u>	Date: <u>August 3, 1993</u>
Inspectors: <u>Tuesday, Belanger, Lasher</u>	P.A. # <u>45-009</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at the site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 10,490 cubic yards. The following elements were elevated at least three times background:  
Lead: 371J mg/kg
- Two adits had minor discharges during the investigation. No MCLs were exceeded for either of the discharges. The chronic aquatic life criteria for lead was exceeded in the Adit #4 discharge.
- West Fork Pilgrim Creek and an unnamed tributary to West Fork Pilgrim Creek converge and flowed within 5 feet of a WR-4. No MCLs were exceeded in upstream or downstream samples collected in West Fork Pilgrim Creek; however, chronic aquatic life criteria for lead were exceeded in both the upstream and downstream samples. Upstream and downstream sediment samples collected in West Fork Pilgrim Creek exhibited metals concentrations similar to background.

Holliday PA# 45-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 08/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
45-009-SE-1	7.52	45.6	0.6 U	7.84	9.96	35.9 J	21000	0.041 J	406	11.5	65 J	7.17 U	96.6	NR
45-009-SE-2	11.3	38.7	0.4 U	6.53	10.5	18.5 J	20900	0.021 J	398	12.6	50.4 J	5.27 U	94.6	NR
45-009-WR-1	12	77.4	0.5 U	9.55	5.86	45.1 J	21300	0.032 J	513	11.1	371 J	6.07 U	125	NR
BACKGROUND	8.68	142	0.6 U	10.4	10.5	21.2 J	22100	0.06 J	710	14.4	33.8 J	6.84 U	78.2	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	TOTAL SULFUR %	NEUTRAL POTENT. %	SULFUR ACID BASE POTENT. %	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. %	SULFUR ACID BASE POTENT. %
45-009-WR-1	0.06	1.87	25.7	23.9	0.01	0.03	0.02	0.92	25.1

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
45-009-GW-1	1.69 U	59.2	2.57 U	9.7 U	6.83 U	1.55 U	11.8 U	0.038 U	4.08 U	12.7 U	3.16	30.7 U	69.7	146
45-009-GW-2	2.54	59.7	2.57 U	9.7 U	6.83 U	1.55 U	11.8 U	0.076 J	4.08 U	12.7	2.89	30.7 U	32	42.4
45-009-SW-1	1.54 J	2.5	2.57 U	9.7 U	6.83 U	1.55 U	17.6 J	0.140 JX	4.08 U	12.7 U	2.15 J	30.7 U	10.2 J	12.3
45-009-SW-2	1.74 J	3.07	2.57 U	9.7 U	6.83 U	1.55 U	11.8 U	0.190 JX	4.08 U	12.7 U	1.38 J	30.7 U	7.57 U	13.1

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
45-009-GW-1	150	< 5.0	9	< 0.05	NR
45-009-GW-2	41	< 5.0	< 5.0	< 0.05	NR
45-009-SW-1	< 5.0	< 5.0	< 5.0	< 0.05	NR
45-009-SW-2	31	< 5.0	< 5.0	< 0.05	NR

LEGEND

- SE1 - Upgradient on unnamed drainage.  
SE2 - Downgradient of mine in W. Fork Pilgrim Creek.  
WR1 - Composite of subsamples WR1, 2, 3A, 3B, 4A, and 4B.  
BACKGROUND - From the Holliday Mine (45-009-SS-1).
- GW1 - Discharge from adit #3 (caved).  
GW2 - Discharge from adit #4 (pipe).  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Jack Waite</u>	County: <u>Sanders</u>
Legal Description: <u>T 22N R 32W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 17</u>
Mining District: <u>White Pine</u>	Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u>
Latitude: <u>N 47° 39' 50"</u>	Primary Drainage: <u>Beaver Creek</u>
Longitude: <u>W 115° 43' 15"</u>	USGS Code: <u>17010213</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Dixie Creek</u>
Quad: <u>Cooper Gulch</u>	Date Investigated: <u>September 7, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>45-002</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with this site.
- The volume of waste rock associated with this site was estimated to be 3800 cubic yards. The following elements were elevated at least three times background:  
Cadmium: 513 mg/kg                      Copper: 97.2 mg/kg  
Lead: 4150 mg/kg                      Zinc: 7920J mg/kg.
- The waste rock dump was unvegetated and also over-steepened in the drainage.
- A discharging adit (GW-1) was present, with a small flow of 3 gpm, a pH of 7.40, and a specific conductance of 280 umhos/cm. The adit discharge did not exceed MCL/MCLGs; but the chronic aquatic life criteria for lead was exceeded.
- Dixie Creek bisected the site. Water samples collected up and down stream of this site documented an observed release of lead and zinc to surface water. The samples did not exceed MCL/MCLGs. The acute and chronic aquatic life criteria were exceeded for lead and zinc, both attributable to this site. An observed release of lead was also documented in the stream sediment samples.
- One adit was open and classified as potentially hazardous.

Jack Waite PA# 45-002  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
45-002-SE-1	9.91 J	69.2	1	9.06	1.53 U	36.6	16600	0.034 U	274	18	866	6.89 UJ	178 J	NR
45-002-SE-2	21 J	68.3	0.8 U	16.2	5.91	20.1	21200	0.044 U	965	16.9	68.7	9.9 UJ	102 J	NR
45-002-WR-1	25.1 J	56.7	513	9.47	1.7	97.2	22300	0.029 U	374	11.4	4150	11.9 J	7920 J	NR
BACKGROUND	8.68	142	0.6 U	10.4	10.5	21.2 J	22100	0.06 J	710	14.4	33.8 J	6.84 U	78.2	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR ACID BASE			PYRITIC SULFUR			ORGANIC SULFUR			PYRITIC SULFUR			SULFUR ACID BASE		
	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.
45-002-WR-1	0.53	16.6	21.2	4.68	0.01	0.34	0.18	10.6	10.6									

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
45-002-GW-1	5.83	16.2	2.57 U	9.7 U	6.83 U	4.07 J	160	0.12 UJX	25.2	12.7 UX	11.5	30.7 U	18.9 J	122
45-002-SW-1	2.38	11.1	2.63 J	9.7 U	7.67	7.5 J	81.3	0.12 UJX	4.08 U	12.7 UX	76.9	30.7 U	82.7 J	62.9
45-002-SW-2	1.69 U	4.07	3.03 J	9.7 U	6.83 U	5.17 J	75.3	0.12 UJX	4.08 U	16.3 JX	4.41	30.7 U	12.4 J	22.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
45-002-GW-1	225	< 5.0	42	< 0.05	NR
45-002-SW-1	162	< 5.0	25	< 0.05	NR
45-002-SW-2	90	< 5.0	8	< 0.05	NR

LEGEND

SE1 - 200 feet downstream of waste rock dump 1.  
SE2 - 100 feet upstream from waste rock dump 1.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Holliday Mine (45-009-SS-1).

GW1 - Add discharge.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Highland</u>	County: <u>Silver Bow</u>
Legal Description: T <u>Mn</u> R <u>W</u>	Section(s): <u>NW 1/4, NE 1/4, Sec. 31</u>
Mining District: <u>Basin Creek</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 47' 50"</u>	Primary Drainage: <u>Silver Bow Creek</u>
Longitude: <u>W 112° 31' 10"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Mount Humbug</u>	Date Investigated: <u>September 17, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>47-028</u>
Organization: <u>Pioneer Technical Services, Inc./ Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings associated with this site. Ore from this mine was processed at the Middle Fork Millsite (PA# 47-081).
- The volume of waste rock associated with this site was estimated to be 40,000 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 139J mg/kg                      Mercury : 0.261J mg/kg  
Copper: 943 mg/kg                      Iron: 128,000JX mg/kg
- The waste rock dumps were approximately 90% unvegetated.
- One discharging adit had a flow of approximately 15 gpm, a pH of 7.42, and a specific conductance of 208 umhos/cm. No MCL/MCLG's were exceeded nor were any aquatic life criteria exceeded in the sample of this discharge.
- The discharge was a source for a perennial flow to Basin Creek. No MCL/MCLGs were exceeded in the downstream sample, however, the chronic aquatic life criteria for mercury was exceeded downstream from the site. The downstream sediment sample also exhibited copper concentrations greater than three times the background soil. Basin Creek was a source of drinking water for the City of Butte.
- Ten cubic yards of a white unknown powder was present at the south end of the site.

Highland PA# 47-028  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-028-SE-1	26.5 J	32.3 J	1.1 U	4.05	3.61 J	38.9	9700 JX	0.038 J	289	71.9	42.9	7.68 UJ	305 J	NR
47-028-WR-1	139 J	38.7 J	1.9 J	9.77	1.81 J	943	128000 JX	0.261 J	491	7.57	13.5	7.09 UJ	79.4 J	NR
BACKGROUND	40.1 J	173 J	1.1 U	10.1	21.1 J	34.3	18500 JX	0.039 J	832	18.1	14.8	7.28 UJ	61.9 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR	
	%	1/1000	ACID BASE	POTENT.	NEUTRAL.	POTENT.	ACID BASE	POTENT.	ACID BASE	POTENT.	ACID BASE	POTENT.
47-028-WR-1	1.64	51.2			321	270	<0.01	2	0.85	62.5	259	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
47-028-GW-1	1.88	12.4	4.59 U	5 U	6.24 U	2.33 U	116	0.12 U	10	10.9 U	1.12	31.7 U	8.71 U	211
47-028-SW-1	1.63	13	4.59 U	5 U	6.24 U	2.33 U	107	0.35	6.3	10.9 U	1.19	31.7 U	8.71 U	206
47-028-SW-2	1.12 U	1.1 U	4.59 U	5 U	6.24 U	2.33 U	13.7 U	0.12 U	3.76 U	10.9 U	0.94 U	31.7 U	8.71 U	0.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
47-028-GW-1	178 <	5	15	0.18	NR
47-028-SW-1	210 <	5	16	0.15	NR
47-028-SW-2	NR	NR	NR	NR	< 0.01

LEGEND

SE1 - At edit discharge below Moose Creek road.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Highland Mine (47-028-SS-1).  
GW1 - Adit #1 discharge.  
SW1 - Adit discharge below Moose Creek road.  
SW2 - QA/QC Blank.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Mary Emme/Clinton</u>	County: <u>Silver Bow</u>
Legal Description: <u>T 3N R 7W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 10</u>
Mining District: <u>Elk Park-Butte</u>	Mine Type: <u>Hardrock/Unknown</u>
Latitude: <u>N 46° 01' 17"</u>	Primary Drainage: <u>Silver Bow Creek</u>
Longitude: <u>W 112° 27' 14"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Woodville Gulch</u>
Quad: <u>Elk Park Pass</u>	Date: <u>August 20, 1993</u>
Inspectors: <u>Babits, Flammang, Lasher</u>	P.A. # <u>47-035</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings associated with site.
- There were approximately 66,620 cubic yards of uncovered waste rock on site. The following elements were elevated at least three times background:  
Mercury: 1.27 mg/kg                      Lead: 834 to 1,670 mg/kg  
Antimony: 61.8 to 235 mg/kg
- There was one discharging adit at the site which entered Woodville Gulch. A sample of this discharge had a pH of 5.40, and MCLs were exceeded for arsenic, cadmium, and lead. The chronic fresh water aquatic life criteria for iron and lead was exceeded. The acute fresh water aquatic life criteria for cadmium was exceeded, and the chronic and acute fresh water aquatic life criteria for copper and zinc were exceeded.
- Woodville Gulch flowed approximately 100 feet from the waste rock. There were no observed releases to downstream surface water or sediment. Cadmium and copper exceeded MCLs, and the acute fresh water aquatic life criteria for cadmium was exceeded in downstream surface water samples. The acute and chronic fresh water aquatic life criteria for copper and zinc were also exceeded in downstream surface water.
- There were three open shafts at the site.

Mary Emmeel/Clinton PA# 47-035  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/20/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-035-SE-1	110	205 J	29 J	13.5 U	10.2	1230	9470	0.232 U	480 J	17.6 U	119	42.6 U	4420 J	NR
47-035-SE-2	48.8	39 J	1.2 U	7.65 J	12.7	347	28400	0.062 U	762 J	5.69 U	91.8	13.8 U	577 J	NR
47-035-WR-2	263	45.1 J	0.4 U	4.67 J	2.33	365	33300	1.27	144 J	3.07	1670	235	1200 J	NR
47-035-WR-1	216	23.4 J	1.8 J	2.09 U	1.47 U	422	17600	0.833	51.5 J	2.72 U	834	61.8	865 J	NR
BACKGROUND	143	228 J	3.7 J	9.72 J	6.81	447	20200	0.177	480 J	3.84	156	6.01 U	911 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	TOTAL SULFUR %	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000	ACID BASE 1/1000	POTENT. 1/1000	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	ACID BASE 1/1000	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000
47-035-WR-1	1.04	32.5	-4	-37	0.49	0.09	0.46	2.81	0.46	2.81	20.6	-6.58	-21.7	-21.7	-21.7	-21.7
47-035-WR-2	2.45	76.5	-1.1	-78	0.69	0.66	1.1	20.6	1.1	20.6	-21.7	-21.7	-21.7	-21.7	-21.7	-21.7

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
47-035-SW-1	3.89 J	33.4	2.57 U	9.7 U	6.83 U	13.3 J	64.3 J	0.12 U	12.7	12.7 U	1.56	30.7 U	248	60.3
47-035-SW-2	1.69 U	21.9	27.9	16.9	6.83 U	2670 J	863 J	0.12 U	2590	12.7 U	4	30.7 U	7970	136
47-035-SW-3	65.6 J	2.01 U	29.7	9.7 U	6.83 U	1260 J	19100 J	0.12 U	2120	12.7 U	28.6	30.7 U	4710	84.7

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
47-035-SW-1	148	< 5.0	29	< 0.05	NR
47-035-SW-2	432	< 5.0	281	< 0.05	NR
47-035-SW-3	8	< 5.0	134	< 0.05	NR

LEGEND

- SE1 - Upgradient of tributary approx. 50' above waste rock dump 1.  
SE2 - 10' above where tributary enters culvert going under freeway.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
WR2 - Composite of subsamples WR2, 3A, 3B, 3C, 4A, and 4B.  
BACKGROUND - From Mary Emmeel/Clinton Mine (47-035-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Add discharge of waste rock dump 1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Rising Sun</u>	County: <u>Silver Bow</u>
Legal Description: T <u>3N</u> R <u>7W</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 22</u>
Mining District: <u>Elk Park</u>	Mine Type: <u>Hardrock/Ag. Cu</u>
Latitude: <u>N 45° 59' 47"</u>	Primary Drainage: <u>Silver Bow Creek</u>
Longitude: <u>W 112° 27' 27"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Tramway Gulch</u>
Quad: <u>Homestake</u>	Date Investigated: <u>September 14, 1993</u>
Inspectors: <u>Bullock/Pierson</u>	P.A. # <u>47-037</u>
Organization: <u>Pioneer Technical Services, Inc./Thomas, Dean and Hoskins, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 2,000 cubic yards. The only element elevated at least three times background was mercury (0.661J mg/kg).
- One adit discharge was present at this site with a flow of approximately 20 gpm and a pH of 7.28. No MCL/MCLGs or acute or chronic aquatic life criteria were exceeded in the adit discharge.
- The adit discharge served as the headwaters for the stream associated with Tramway Gulch. No other surface water was observed on or near the site.
- The adit opening was identified as a potential safety hazard. Recreation use in the area appeared to be high.

Rising Sun PA# 47-037  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 09/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-037-WR-1	10 J	83.2	0.86 U	7.71	4.89	24.5	13500	0.661 J	311	4.04	9.26	5.9 UU	37	NR
BACKGROUND	143	228 J	3.7 J	9.72 J	6.81	447	20200	0.177	480 J	3.84	156	6.01 U	911 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR ACID BASE			SULFUR NEUTRAL			SULFUR ACID BASE			PYRITIC			PYRITIC			SULFUR		
	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x	SULFUR %	ACID BASE 1/1000x	POTENT. 1/1000x
47-037-WR-1	0.01	0.31	13.6	13.3	<0.01	<0.01	<0.01	<0.01	0.01	0	13.6										

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
47-037-GW-1	3.06	15.1	4.59 U	5 U	6.24 U	2.33 U	13.7 U	0.12 U	3.76 U	10.9 U	1.22 U	31.7 U	8.71 U	98.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
47-037-GW-1	180	< 5	33	0.12	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Mary Emma/Clinton Mine (47-035-SS-1).  
GW1 - Open, discharging adit #1.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Old Glory</u>	County: <u>Silver Bow</u>
Legal Description: <u>T 1S R 8W</u>	Section(s): <u>NW 1/4, NW 1/4, Sec. 31</u>
Mining District: <u>Melrose</u>	Mine Type: <u>Hardrock/Ag. Au. Cu</u>
Latitude: <u>N 45° 42' 40"</u>	Primary Drainage: <u>Soap Gulch</u>
Longitude: <u>W 112° 38' 38"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Soap Gulch</u>
Quad: <u>Melrose</u>	Date Investigated: <u>August 24, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>47-027</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were associated with this site.
- The volume of waste material at the site was estimated to be 10,025 cubic yards. The following elements were elevated at least three times background:

Arsenic: 843 mg/kg	Cadmium: 6.2 mg/kg
Mercury: 0.608J mg/kg	Manganese: 11,600 mg/kg
Nickel: 92.1J mg/kg	Lead: 254 mg/kg
Antimony: 12.6J mg/kg.	
- The waste rock dumps were unvegetated.
- No discharging adits, seeps, or springs were observed.
- No surface water samples were collected as there was no surface water on or near the site.
- Hazards present at the site during the investigation included an old cabin near the shaft, and unstable slopes around the collapsed shaft.

Old Glory PA# 47-027  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BULLOCK  
 INVESTIGATION DATE: 08/24/83

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-027-WR-1	843	414 J	6.2	36.9	4.38	69.3	28300	0.608 J	11800	92.1 J	254	12.6 J	354	NR
BACKGROUND	56	169	0.8 JX	13.8	29.4	34.2	25300	0.014 U	462	26	30	4 UJ	119	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. /1000x	SULFUR ACID BASE POTENT. /1000x	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE /1000x	SULFUR ACID BASE POTENT. /1000x
47-027-WR-1	0.12	3.75	5.06	1.31	0.12	<0.01	0.01	0	5.06

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 2, and 3.  
 BACKGROUND - From the Emma Mine (29-061-SS-1).

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Clipper</u>	County: <u>Silver Bow</u>
Legal Description: T <u>1S</u> R <u>8W</u>	Section(s): <u>NE 1/4, NW 1/4, Sec. 26</u>
Mining District: <u>Melrose</u>	Mine Type: <u>Hardrock/Cu</u>
Latitude: <u>N 45° 43' 30"</u>	Primary Drainage: <u>Camp Creek</u>
Longitude: <u>W 112° 33' 35"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Wickiup Creek</u>
Quad: <u>Wickiup Creek</u>	Date Investigated: <u>August 24, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>47-029</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- There were no mill tailings observed at this site during the investigation.
- The volume of waste rock associated with this site was estimated to be approximately 3,760 cubic yards. The following elements were elevated at least three times background:

Arsenic: 177 to 236 mg/kg	Cobalt: 86 mg/kg
Copper: 1290 to 19,100 mg/kg	Mercury: 0.219J to 0.293J mg/kg
Lead: 389 to 979 mg/kg	Antimony: 274J mg/kg
- One discharging adit was identified at the site. The MCL for copper was exceeded in the adit discharge. Also, the acute and chronic aquatic life criteria for copper and chronic aquatic life criteria for mercury and lead were exceeded in the adit discharge.
- Upstream and downstream surface water samples were collected from Wickiup Creek. No MCLs were exceeded in either of the samples; however, chronic aquatic life criteria were exceeded for mercury and lead in both the upstream and downstream samples. Acute and chronic aquatic life criteria were exceeded for copper in the downstream sample.
- An observed release to Wickiup Creek was documented for copper. The acute and chronic aquatic life criteria exceedances for copper in Wickiup Creek were directly attributable to the site. Additionally, concentrations of arsenic, cobalt, copper, and lead were significantly elevated (>3X) in the downstream sample when compared to the upstream sample.
- Two potentially hazardous mine openings were identified at the site including a fenced shaft and an open adit.

Clipper PA# 47-029  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/24/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-029-SE-1	44.4	20.4 J	1.1 U	18.4	6.72	1650	32400	0.031 U	85.5	13.6 J	41.8	7.26 UJ	43.7	NR
47-029-SE-2	10.4	29.4 J	0.8 U	5.02	8.09	12.7	17800	0.034 U	181	11.8 J	5.43 U	5.24 UJ	27.3	NR
47-029-WR-1	236	2.79 J	0.8 U	2.45	3.04	1290	27100	0.219 J	20.2	3.37 J	389	5.67 UJ	14.6	NR
47-029-WR-2	177	15.4 J	1.4	86	9.37	19100	39400	0.293 J	609	18.2 J	979	274 J	87.3	NR
BACKGROUND	56	169	0.8 JX	13.8	29.4	34.2	25300	0.014 U	462	26	30	4 UJ	119	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENTIAL		SULFUR ACID BASE POTENTIAL		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE POTENTIAL		SULFUR ACID BASE POTENTIAL	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
47-029-WR-1	0.92	28.7	-0.3	2.62	0.76	-29	0.03	0.03	0.13	0.94	0.00	0.00	-1.23	2.62
47-029-WR-2	0.12	3.75			0.06	-1.1	<0.01		0.06					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
47-029-GW-1	1.97	4.93	2.57 U	43.3	6.83 U	3050	725	0.18 JX	165	25.3	4.29 J	30.7 U	52.6 J	68.9
47-029-SW-1	2.18	8.03	2.57 U	9.7 U	10.3 J	206	291	0.45 JX	37.6	12.9	2.72 J	30.7 U	7.9 J	57.2
47-029-SW-2	2.67	7.73	2.57 U	9.7 U	6.83 U	1.55 U	102	0.16 JX	8.2	20	3.52 J	30.7 U	13.1 J	52.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
47-029-GW-1	131	< 5.0	40	0.11	NR
47-029-SW-1	106	< 5.0	15	< 0.05	NR
47-029-SW-2	107	< 5.0	11	< 0.05	NR

LEGEND

- SE1 - Downstream from mine site in Wickup Creek.  
SE2 - Upstream from mine in Wickup Creek.  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.  
WR2 - Composite of subsamples WR3, 5, and 6.  
BACKGROUND - From the Emma Mine (29-061-SB-1).
- GW1 - Adit #1 discharge.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Middle Fork Millsite</u>	County: <u>Silver Bow</u>
Legal Description: T <u>1N</u> R <u>8W</u>	Section(s): <u>SW 1/4, SE 1/4, Sec. 36</u>
Mining District: <u>Moose Creek</u>	Mine Type: <u>Mill tailings/Au</u>
Latitude: <u>N 46° 47' 15"</u>	Primary Drainage: <u>Moose Creek</u>
Longitude: <u>W 112° 33' 10"</u>	USGS Code: <u>10020004</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Middle Fork Moose Ck.</u>
Quad: <u>Mount Humbug</u>	Date Investigated: <u>August 27, 1993</u>
Inspectors: <u>Bullock, Tuesday</u>	P.A. # <u>47-081</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of mill tailings associated with this site was estimated to be 36,500 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 261J to 265J mg/kg      Copper: 783 to 1120 mg/kg  
Iron: 70,700 to 106,000 mg/kg      Mercury: 0.705J to 0.93J mg/kg  
Lead: 62 to 195 mg/kg      Zinc: 241 mg/kg
- There was no waste rock associated with this site.
- There were no discharges associated with mine openings at this site. Several seeps were identified associated with small tributaries to Moose Creek.
- Moose Creek was sample upstream and downstream of this site. The water samples documented an observed release of iron, attributable to this site. Sampling did not document exceedances of MCL/MCLGs or aquatic life criteria attributable to this site. Stream sediment samples documented observed releases of arsenic, copper, iron, mercury, lead, and zinc.
- Level areas of the tailings impoundments were well vegetated, except where disturbed by cattle grazing.

**Middle Fork Millsite PA# 47-081**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/27/93**

**SOLID MATRIX ANALYSES**

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
47-081-SE-1	418 J	204	2.59 J	27.8	14.3	993	127000	0.546 J	6420	20	109	14.8 U	249	NR
47-081-SE-2	1090 J	259	9.08 J	19.1	7.27 U	393	221000	0.805 J	2070	13.5	75.1	36.9 U	635	NR
47-081-SE-3	12.5 J	96.3	0.99 U	5.56	7.05	14.5	8490	0.126 J	349	8.54	7.05 U	6.8 U	24.1	NR
47-081-TP-1	261 J	29.5	1.52 J	6.68	15.5	783	70700	0.93 J	213	5.73	62	7.16	155	NR
47-081-TP-2	265 J	40	2.47 J	13.5	10.7	1120	106000	0.705 J	432	7.99	195	7.71 U	241	NR
BACKGROUND	40.1 J	173 J	1 U	10.1	21.1 J	34.3	18500 JX	0.039 J	832	18.1	14.8	7.28 UJ	61.9 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000	NEUTRAL. 1/1000	ACID BASE 1/1000	POTENT. 1/1000	SULFUR %	SULFUR %	PYRITIC %	PYRITIC 1/1000	SULFUR %	SULFUR 1/1000	ACID BASE 1/1000	ACID BASE 1/1000	POTENT. 1/1000	POTENT. 1/1000
47-081-TP-1	1.15	35.9	98.3	62.4	-37	98.3	62.4	-37	0.78	0.78	0.27	8.43	0.1	0.37	8.43	88.4	89.9	-32
47-081-TP-2	3	93.7	56.4			56.4			<0.01	<0.01	2.83							

**WATER MATRIX ANALYSES**

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
47-081-SW-1	4.15	30	4.59 U	5 U	6.24 U	9.23 J	467 J	0.21	49.9	10.9 U	2.1	31.7 U	8.71 U	295
47-081-SW-2	3.03	24.5	4.59 U	5 U	6.24 U	5.73 J	371 J	0.21	27.6	10.9 U	0.94 U	31.7 U	8.71 U	209
47-081-SW-3	3.53	37.9	4.59 U	5 U	6.24 U	10.6 J	46.7 J	0.19	30.9	10.9 U	0.94 U	31.7 U	8.71 U	219

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
47-081-SW-1	329	< 5.0	57	< 0.05	NR
47-081-SW-2	285	< 5.0	52	< 0.05	NR
47-081-SW-3	272	< 5.0	7	< 0.05	NR

**LEGEND**

- SE1 - Downstream below lowest tailings pond.
- SE2 - Intermediate sample on tributary between mill and tailings.
- SE3 - Upgradient on Middle Fork Moose Creek.
- TP1 - Composite of subsamples TP1, 2A-A, 2A-B, and 2A-C.
- TP2 - Composite of subsamples TP3A-A, 3A-B, and 4.
- BACKGROUND - From the Highland Mine (47-028-S5-1).
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Same as sample SE3.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

<b>Mine/Site Name:</b> <u>Benbow Millsite</u>	<b>County:</b> <u>Stillwater</u>
<b>Legal Description:</b> <u>T 5S R 16E</u>	<b>Section(s):</b> <u>NW 1/4, Sec. 21</u>
<b>Mining District:</b> <u>Stillwater</u>	<b>Mine Type:</b> <u>Hardrock/Cr, Fe, Ni</u>
<b>Latitude:</b> <u>N 45° 23' 20"</u>	<b>Primary Drainage:</b> <u>Stillwater River</u>
<b>Longitude:</b> <u>W 109° 45' 55"</u>	<b>USGS Code:</b> <u>10070005</u>
<b>Land Status:</b> <u>Public</u>	<b>Secondary Drainage:</b> <u>Little Rocky Creek</u>
<b>Quad:</b> <u>Nye</u>	<b>Date Investigated:</b> <u>August 11, 1993</u>
<b>Inspectors:</b> <u>Babits, Flammang, Lasher</u>	<b>P.A. #</b> <u>48-005</u>
<b>Organization:</b> <u>Pioneer Technical Services, Inc.</u>	

- There were approximately 5,950 cubic yards of mostly covered mill tailings at the site. The following were elevated at least three times background:

Cadmium: 1.08J to 1.60J mg/kg	Cobalt: 44.7 to 68.3 mg/kg
Chromium: 66.8 to 908 mg/kg	Mercury: 0.199 mg/kg
Nickel: 72.3 to 983 mg/kg	
- There was no waste rock associated with this site.
- There were no discharging adits at the site.
- An unnamed tributary of Little Rocky Creek flowed adjacent to the tailings. There were observed releases of cobalt, chromium, and nickel in downstream sediment, and there were no observed releases to downstream surface water. No MCL/MCLGs or fresh water aquatic life criteria were exceeded in downstream surface water.
- A conveyor gallery in the mill was partially open and hazardous and the mill wall is 20 feet high.

**Benbow Millsite PA# 48-005**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/11/93**

**SOLID MATRIX ANALYSES**

**Metals in soils**  
**Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
48-005-SE-1	6.77 U	71	0.74 U	5.62	46 J	13.9	7060	0.051 U	183	23.9	11.6 U	8.82 UJ	39.4	NR
48-005-SE-2	5.38 U	16.1	0.59 U	34.7	497 J	13.3	25200	0.102	625	531	9.22 U	7 UJ	13.9	NR
48-005-SE-3	11.4 U	85.9 J	1.25 UJ	16.5	160	33.9	21600	0.088 U	511	134	38.8	14.9 UJ	68.6	NR
48-005-SE-4	4.76 U	22 J	0.52 UJ	44.7	495	16.1	34800	0.034 U	687	968	8.16 U	6.2 UJ	25.9	NR
48-005-TP-1	5.18 U	9.25 J	1.08 J	68.3	908	26	43700	0.199	1040	953	8.88 U	6.74 UJ	25.6	NR
48-005-TP-2	4.12 U	5.36 J	1.60 J	67.4	715	16.1	44800	0.03 U	754	983	7.06 U	5.36 UJ	24.9	NR
48-005-TP-3	8.68	134 J	0.56 UJ	11.6	66.8	13.5	20700	0.034 U	806	72.3	16.4	6.68 UJ	58.7	NR
BACKGROUND	14.8 J	97.1	0.54 U	6.45	10.8 J	12.9	21100	0.051	381	11.5	11.8	6.41 UJ	58.1	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR %	ACID BASE	V/1000	NEUTRAL POTENT.	ACID BASE	POTENT.	SULFUR %	ACID BASE	POTENT.	SULFUR %	ACID BASE	POTENT.
48-005-TP-1	0.04	1.25		108	107		0.03	0.31		108		
48-005-TP-1DUP	0.04	1.25		109	108		0.04	0.00		109		
48-005-TP-2	0.01	0.31		87.3	87.0		0.01	0.00		87.3		
48-005-TP-3	0.03	0.94		10.3	9.35		0.03	0.31		9.97		

**WATER MATRIX ANALYSES**

**Metals in Water**  
**Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
48-005-SW-1	1.18 U	28.3	2.57 U	9.7 U	6.83 U	2.03	112	0.16	4.13	12.7 U	1.09 J	30.7 U	11.7	83
48-005-SW-2	1.19	41.3	2.57 U	9.7 U	8.6	1.7	645	0.12 U	60.4	12.7 U	1.23 J	30.7 U	7.57 U	139

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry**  
**Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
48-005-SW-1	123	< 5.0	14	< 0.05	NR
48-005-SW-2	169	< 5.0	7	< 0.05	NR

**LEGEND**

- SE1 - In unnamed trib. N of road crossing.  
 SE2 - In unnamed trib. at base of tailings pond 2.  
 SE3 - In Little Rocky Creek, 50' upstream of confluence with unnamed tributary.  
 SE4 - In Little Rocky Creek, 50' downstream of confluence with unnamed tributary.  
 TP1 - Composite of subsamples TP1AA, 1BA, and 1BB.  
 TP2 - Composite of subsamples TP2AA, 2AB, and 2BA.  
 TP3 - Sample of the TP2BB subsample.
- BACKGROUND - From the Benbow Millsite (48-005-SB-1).  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

**MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU  
HAZARDOUS MATERIALS INVENTORY  
SITE SUMMARY**

Mine/Site Name: <u>Yager/Daisy</u>	County: <u>Sweetgrass</u>
Legal Description: T <u>7S</u> R <u>12E</u>	Section(s): <u>NE 1/4, SW 1/4, Sec. 15</u>
Mining District: <u>Independence</u>	Mine Type: <u>Hardrock/Au</u>
Latitude: <u>N 45° 13' 17"</u>	Primary Drainage: <u>Boulder River</u>
Longitude: <u>W 110° 13' 10"</u>	USGS Code: <u>10070002</u>
Land Status: <u>Private/Public</u>	Secondary Drainage: <u>Basin Creek</u>
Quad: <u>Haystack Peak</u>	Date Investigated: <u>August 11, 1993</u>
Inspectors: <u>Bullock, Belanger, Clark</u>	P.A. # <u>49-002</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The volume of tailings present on the site was estimated to be 1700 cubic yards. The tailings were not contained in any impoundment and were in contact with a wetlands area. The following elements were elevated at least three times background:  
Arsenic: 138 mg/kg                      Mercury: 1.91 to 31.9 mg/kg  
Lead: 226 to 700 mg/kg
- The volume of waste rock associated with this site was estimated to be 10,150 cubic yards. The following elements were elevated at least three times background:  
Arsenic: 59.1 mg/kg                      Cadmium: 2.92J mg/kg  
Copper: 160 to 168 mg/kg              Mercury: 0.644 to 23.5 mg/kg  
Lead: 389 to 2520 mg/kg
- Four discharging adits were present on site. GW-1 was flowing at approximately 15 gpm, had a pH of 6.85, and a specific conductance of 110 umhos/cm. Water from this adit did not exceed MCL/MCLGs, but did exceed chronic aquatic life criteria for copper and lead. GW-2 had a flow of approximately 10 gpm, a pH of 7.28, a specific conductance of 70 umhos/cm, and exceeded acute and chronic aquatic life criteria for copper. GW-3 was flowing at approximately 5 gpm, had a pH of 6.99 and a specific conductance of 170 umhos/cm. The water from this adit exceeded the MCL/MCLG for nickel, the chronic aquatic life criteria for copper, nickel, and zinc, and acute aquatic life criteria for copper and zinc. GW-4 had a flow at approximately 6 gpm, a pH of 3.78, a specific conductance of 190 umhos/cm, and exceeded chronic aquatic life criteria for iron and lead.
- Basin Creek flowed past the south side of the site. Water in the creek did not exceed MCL/MCLGs, but did exceed the acute and chronic aquatic life criteria for copper. This exceedance was attributable to the site. No observed releases were documented in either the surface water or the sediments.
- One open shaft and several structures were classified as potentially hazardous.

**Yager/Daisy PA# 49-002**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/11/83**

**SOLID MATRIX ANALYSES**

**Metals in soils**      **Results per dry weight basis**

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
49-002-SE-1	5.66	49.2 J	0.54 UJ	5.8	17.7	58.8	12100	0.032 U	205	12.2	50.5	6.44 UJ	49.3	NR
49-002-SE-2	5.21 U	45.8 J	0.57 UJ	9.28	17.7	61.6	13200	0.031 U	307	16.6	109	6.78 UJ	82.8	NR
49-002-TP-1	138	122 J	0.56 UJ	2.73	6.13	95.4	29300	1.91	24.8	6.87	700	6.72 UJ	82.2	NR
49-002-TP-2	19.6	82.4 J	1.31 J	7.82	8.82	65	25300	31.9	99	12	228	5.78 UJ	64	NR
49-002-WR-1	59.1	140 J	2.92 J	31	9.42	168	56900	0.644	627	24.5	2520	5.91 UJ	296	NR
49-002-WR-2	30.8	155 J	0.88 J	12.1	17.4	160	41400	23.5	199	18.9	389	5.77 UJ	40.4	NR
BACKGROUND	16.3	78.3 J	0.68 J	13.5	45.6	40.1	28500	0.064	612	24	37.2	7.97 UJ	99	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	TOTAL	SULFUR	ACID BASE	POTENT.	TOTAL	SULFUR	ACID BASE	POTENT.	PYRITIC	SULFUR	ACID BASE	POTENT.	SULFUR	ACID BASE	POTENT.	V1000R
49-002-TP-1	0.60	18.7	-1.05	-19.8	0.32	0.48	10.0	-11.0								
49-002-TP-2	2.34	73.1	1.83	-71.3	0.75	1.06	23.4	-21.6								
49-002-WR-1	3.59	112	0.86	-111	1.85	2.45	51.5	-50.7								
49-002-WR-2	2.51	78.4	0.07	-78.3	0.37	1.58	11.6	-11.5								

**WATER MATRIX ANALYSES**

**Metals in Water**      **Results in ug/L**

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
49-002-GW-1	1.18 U	37.5	2.57 U	9.7 U	6.83 U	5.37	112	0.12 U	4.08 U	12.7 U	1.33 J	30.7 U	10.1	30.8
49-002-GW-2	1.18 U	33	2.57 U	9.7 U	6.83 U	8.13	11.8 U	0.12 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	18.1
49-002-GW-3	1.18 U	32.9	2.57 U	9.7 U	14.7	186	155	0.12 U	9.17	115	1.22 J	30.7 U	171	51.2
49-002-GW-4	1.18 U	26.3	2.57 U	9.7 U	6.83 U	3.07	1500	0.12 U	92.5	12.7 U	9.37 J	30.7 U	20.5	23.9
49-002-SW-1	1.18 U	24.3	2.57 U	9.7 U	6.83 U	4.53	137	0.12 U	8.43	12.7 U	1.05 J	30.7 U	12.4	14.6
49-002-SW-2	1.18 U	14.5	2.57 U	9.7 U	6.83 U	2.27	15.2	0.12 U	4.08 U	12.7 U	0.75 J	30.7 U	10.3	19.7

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

**Wet Chemistry**      **Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
49-002-GW-1	71	8.0	22	< 0.05	NR
49-002-GW-2	56	8	9	< 0.05	NR
49-002-GW-3	100	7.0	46	0.06	NR
49-002-GW-4	72	< 5.0	37	0.05	NR
49-002-SW-1	45	6	9	< 0.05	NR
49-002-SW-2	56	13	8	< 0.05	NR

**LEGEND**

- SE1 - In Basin Creek, downgradient from site.  
 SE2 - In Basin Creek, upgradient of site.  
 TP1 - Composite of subsamples TP1A-A, 1B-A, and 1C-A.  
 TP2 - Composite of subsamples TP1A-B, 1B-B, and 1C-B.  
 WR1 - Composite of subsamples WR1A, 1B, 2A, 2B, and 3.  
 WR2 - Composite of subsamples WR2C, 4A, 5A, 5B, 6A, and 6B.  
 BACKGROUND - From the Poor Man/Emma Mine (49-001-S5-1).
- GW1 - Add discharge above lower, waste rock dump 6A.  
 GW2 - Add discharge above waste rock dump 5.  
 GW3 - Add discharge above waste rock dump 4.  
 GW4 - Add discharge above waste rock dump 2.  
 SW1 - Same as sample SE1.  
 SW2 - Same as sample SE2.

## **6.0 REFERENCES**

- AMRB/Pioneer, 1993a and 1994a. Sampling and Analysis Plan for the Abandoned Mines Hazardous Materials Inventory, May 1993 and May 1994.**
- AMRB/Pioneer, 1993b and 1994b. Quality Assurance Project Plan for the Abandoned Mines Hazardous Materials Inventory, June 1993 and May 1994.**
- AMRB/Pioneer, 1993c and 1994c. Laboratory Analytical Protocol for the Abandoned Mines Hazardous Materials Inventory, June 1993 and May 1994.**
- AMRB/Pioneer, 1993d and 1994d. Health and Safety Plan for the Abandoned Mines Hazardous Materials Inventory, May 1993 and May 1994.**
- AMRB/Pioneer, 1993e and 1994e. Abandoned Hardrock Mines Project Report for the Abandoned Hardrock Mine Priority Sites, March 1994 and December 1994.**
- AMRB/Pioneer, 1993f and 1994f. Data Validation and Evaluation Report for the Abandoned Mines Hazardous Materials Inventory, March 1994 and December 1994.**
- MBMG, Well Log Database, July 14, 1994.**
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.**
- MDHES/WQB, 1994. Montana Numeric Water Quality Standards, Circular WQB-7, July 15, 1994.**





## **GLOSSARY**

**Abandoned Mine; Abandoned Workings** - Excavations, either open, caved, or sealed, that are deserted and in which further mining is not intended.

**Acid Mine Water** - Mine water which contains sulfuric acid, mainly due to the oxidation of iron pyrite.

**Acidity** - Estimate of the capacity for a neutral water to neutralize caustic wastes without disturbing biological activities.

**Activator (floatation mill)** - A reagent that facilitates floatation of selected mineral species in a floatation cell.

**Acute Aquatic Life Criteria** - EPA's maximum acute toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

**Adit** - A horizontal or nearly horizontal passage driven in rock from the surface of the working or dewatering of a mine.

**Alkalinity** - Estimate of the capacity for a neutral water to neutralize acidic wastes without disturbing biological activities.

**Alluvium** - Sediments deposited on land by streams and rivers.

**AIMSS** - Abandoned and Inactive Mines Scoring System.

**Amalgamation** - The process by which mercury is alloyed with some other metal to produce an amalgam. Used at one time for the extraction of gold and silver from pulverized ores.

**Attribution** - To document an observed release of a hazardous substance(s) to the environment, the presence of the hazardous substance(s) must be attributable to a waste source at the site. For example, if an observed release to surface water can be established for copper, the concentration of copper in any waste source at the site must exist at greater than three times the background concentration of copper to establish attribution to the site.

**BLM** - United States Department of Interior, Bureau of Land Management.

**Ball Mill** - A rotating horizontal cylinder in which nonmetallic materials are ground using various types of grinding media, such as quartz pebbles, porcelain balls, or steel balls.

**Barren Solution** - Leaching solution that has been chemically stripped of metal values. Typically, the barren solution is recharged with leaching agent and recycled.

**Benefication** - The processing of ores for the purpose of: (1) regulating the size of a desired product, (2) removing unwanted constituents, and (3) improving the quality, purity, or assay grade of a desired product.

**Bore Hole** - An exploratory or prospecting hole made by drilling.

**CECRA** - The Comprehensive Environmental Cleanup and Responsibility Act.

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

**Claim** - An area of land claimed by an individual or corporation for the ultimate purpose of mineral extraction. The dimensions of a lode claim are 600 by 1,500 feet; for a placer claim, 600 by 1,320 feet.

**Chronic Aquatic Life Criteria** - EPA's maximum chronic toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

**Collar** - The term applied to the timbering or concrete around the mouth or top of a shaft. The junction of a mine shaft with the surface.

**Collector (floatation mill)** - A reagent that aids or facilitates the attraction of mineral particles to the froth in a floatation cell.

**Comminution** - To reduce solids to minute particles by crushing and grinding to liberate metals.

**Concentrate** - To separate metal or ore from the associated gangue or barren rock.

**Concentrate (mineral concentrate)** - Enriched ore after the removal of waste in a beneficiation mill.

**Concentrator** - Mill or plant in which ore is concentrated by removing unwanted constituents.

**Containment** - Engineered structures designed to prevent releases to groundwater, such as liners, covers, and run-on diversions.

**Country Rock** - General term applied to the rock surrounding and penetrated by mineralized veins; in a wider sense applied to the rocks invaded by and surrounding an igneous intrusion.

**Cribbing** - A method of timbering used primarily to rectify the removal of too great a percentage of the rock on the advance, and has the effect of replacing part of the rock.

**Crosscut** - (1) a passageway driven at right angles to the main entry to connect it with a parallel entry of air course. (2) A horizontal opening driven across the course of a vein or in general perpendicular to the direction of the main workings.

**Crusher** - A machine for crushing rock or other materials. Among the various types of crushers are the ball-mill, gyratory crusher, Hadsel mill, jaw crusher, rod mill, rolls, stamp mill, and tube mill.

**Cyanide** - A salt or ester of hydrocyanic acid. In aqueous solution, cyanide is used to dissolve metal from gangue material for later recovery.

**Cyclone** - A device for classification by centrifugal means of fine particles suspended in water, whereby the coarser grains collect and are discharged at the apex of the vessel, while the finer particles are eliminated with the bulk of the water at the discharge orifice.

**Depressant (floatation mill)** - A reagent that causes selected mineral species to sink in a floatation cell.

**Drift** - A horizontal passage underground. A drift follows the vein, as distinguished from a crosscut, which intersects it.

**Drainage Basin Code** - Code assigned to each discrete hydrologic unit by the U.S. Geological Survey.

**DHES/SHWB** - Montana Department of Health and Environmental Sciences, Solid and Hazardous Waste Bureau.

**DHES/WQB** - Montana Department of Health and Environmental Sciences, Water Quality Bureau.

**DNRC** - Montana Department of Natural Resources and Conservation.

**DSL/AMRB** - Montana Department of State Lands, Abandoned Mine Reclamation Bureau.

**Dump** - A pile or heap of waste rock material or other non-ore refuse near a mine.

**Electrowinning** - Recovery of a metal from an ore or solution by electrochemical processes.

**EPA** - United States Environmental Protection Agency.

**Face** - the surface exposed by excavation. the working face, front, or forehead is the face at the end of the tunnel heading, or at the end of the full size excavation.

**Floodplain** - An alluvial plain caused by the overbank deposition of alluvial material. They typically appear as flat expanses of land bordering a stream or river. Most floodplains are accompanied by a series of alluvial terraces of varying levels.

**Fluvial** - Pertaining to or produced by the action of a stream or river.

**Floatation** - The method of mineral separation which a froth created in water by a variety of reagents floats some finely crushed minerals, whereas other mineral sink.

**Floatation Cell** - Device in which froth floatation of ores is performed. It has provisions for receiving conditioned pulp, aerating the pulp, and for separate discharge of the resulting mineralized froth and impoverished tailings.

**Frother** - A reagent which serves to stabilize the froth in a floatation cell until it can be scraped off into the concentrate launder.

**Glory Hole** - Large, open hole typically associated with a mined-out or widened shaft.

**Gravity Mill** - A process in which heavy metals or minerals are separated from waste by the action of agitation and gravity on materials suspended in a liquid, usually water.

**Grizzly** - A device used for coarse screening of bulk materials. A rugged screen for rough sizing at a comparatively large size (for example, 6-inches); it can comprise fixed or moving bars, disks, or shaped tumblers or rollers.

**Hand Auger** - A large tool modeled after the carpenter's drill used in soil sampling.

**Hazardous Substance** - CERCLA hazardous substances, pollutants, and contaminants as defined in CERCLA Sections 101(14) and 101(33).

**Headframe** - The vertical steel or timber frame at the top of a shaft, which carries the sheave or pulley for the hoist.

**Heavy Metal** - Principally the metals zinc, copper, cobalt, and lead; however, may include one or more of the following metals: bismuth, cadmium, gold, indium, iron, manganese, mercury, nickel, palladium, silver, thallium, and tin (often included, though not a metal).

**Highwall** - The unexcavated face of exposed overburden and coal or ore in an open-cast mine or the face or bank on the uphill side of contour strip mine excavation.

**Hoist** - (1) A drum on which wire rope is wound in the engine house, as the cage or skip is raised in the hoisting shaft. (2) An engine with a drum used for winding up a load from a shaft.

**HRS** - EPA's Hazard Ranking System (Federal Register, Vol. 55, No. 241, pp. 51532-51667).

**Inclined Shaft or Incline** - A non-vertical shaft; usually along the dip of a vein.

**Intermittent Stream** - A stream or stretch of stream which flows only at certain times of the year when it receives water from springs, snow melt or storm runoff.

**Jaw Crusher** - A primary crusher designed to reduce large rocks or ores to sizes capable of being handled by a secondary crusher. It consists of a moving jaw, hinged at one end, which swings toward and away from a stationary jaw in a regular oscillatory cycle.

**Jig (Mineral Jig)** - A machine in which the feed is stratified in water by means of a pulsating motion and from which the stratified products are separately removed, the pulsating motion usually being obtained by alternate upward and downward currents of water.

**Latitude** - The angular distance north or south from the equator of a point on the earth's surface, expressed in degrees.

**Leaching** - (1) The removal in solution of the more soluble minerals by percolating waters. (2) Extracting a soluble metallic compound from an ore by selectively dissolving it in a suitable solvent, such as water, sulfuric acid, hydrochloric acid, cyanide, etc.

**Legal Description** - The Township, Range, Section, and typically quarter/quarter section location.

**Level** - A main underground roadway or passage driven along the level course to afford access to the stopes or workings and to provide ventilation and haulageways for the removal of ore.

**Loadout** - A receptacle for ore awaiting treatment or shipment, also referred to as an ore bin.

**Longitude** - An angular distance east or west from the meridian of some particular place to the prime meridian at Greenwich, England.

**MCL** - Maximum contaminant level: Established under the Safe Drinking Water Act.

**MCLG** - Maximum contaminant level goal: Established under the Safe Drinking Water Act.

**MBMG** - Montana Bureau of Mines and Geology.

**Master Inventory** - Inventory of all identifiable abandoned or inactive hardrock mine sites in Montana conducted by the MDSL/AMRB.

**Mesh** - The number of openings per unit area of a screen (sieve).

**Mill** - A mineral treatment plant in which crushing, grinding, and further processing of ore is conducted to produce a product.

**Milling** - The processing of ore to produce a product.

**Mine** - Excavation of earth for the extraction of ore or other economic minerals.

**Mine Development** - The term used to describe the operations involved in preparing a mine for ore extraction. These operations may include tunneling, sinking, crosscutting, drifting, and raising.

**Mineral** - An inorganic substance occurring in nature, though not necessarily of inorganic origin, which has: (1) a definite chemical composition or, more commonly, a characteristic range of composition, and (2) distinctive physical properties or molecular structure.

**Mineral Dressing** - Physical and chemical concentration of raw ore into a product from which a metal can be recovered for a profit.

**Mineral Deposit** - A surface or underground body of mineral matter that may be utilized for its industrial mineral or metal content.

**Observed Release** - Concentration of hazardous substance(s) has increased significantly (greater than three times) above the background concentration for the site for that specific type of sample. For example, to document an observed release to surface water, a contaminant concentration detected in a surface water sample collected downstream from a site must exceed the concentration detected in a surface water sample collected upstream from the site by more than three times. See also "Attribution".

**Open Pit Mining** - A form of operation designed to extract minerals that lie near the surface.

**Open Stope Method** - Stopping in which no regular artificial method of support is employed, although occasional props or cribs may be used to hold local patches of insecure ground. Usually confined to relatively small, narrow ore bodies.

**Ore** - A mineral, or mineral aggregate, containing precious or useful metals, and which occurs in such quantity, grade, and chemical combination as to make extraction commercially profitable.

**Ore Bin** - A receptacle for ore awaiting treatment or shipment, also referred to as a loadout.

**Ore Body** - A solid and fairly continuous mass of ore, which may include low-grade ore and waste, as well as high-grade material.

**Ore Deposit** - A general term applied to rocks containing minerals of economic value in such amount that they can be profitably tracted.

**Oxidation/Reduction Potential** - The hypothetical electron activity at equilibrium. A measurement of the relative tendency (potential) of a solution to accept or transfer electrons, measured in volts.

**PA No.** - Problem Area Number established by the MDL/AMRB.

**Perennial Stream** - A stream or stretch of a stream that flows continuously throughout the year.

**pH** - A measure of the degree of acidity or basicity of a solution. At 25°C, a pH of 7 is neutral. Acidity increases as measurements decrease below 7, and basicity increases as measurements increase above 7.

**Placer** - A mineral concentration resulting from weathering processes, usually involving water. Placer deposits are typically composed of heavy minerals, with gold, platinum, tin, and diamonds being the most important.

**Ponded** - A condition in which free water covers the soil surface, as in a closed depression.

**Portal** - (1) The surface entrance to a drift, tunnel, or adit; (2) The entrance to a mine.

**Pregnant Solution** - Metal-laden solution (cyanide, acid, etc.) resulting from a leach process.

**Primary Drainage** - The primary drainage is the smallest named stream segment/drainage basin that is locatable on the USGS Hydrologic Unit Map within which the mine site is located.

**Prospect** - (1) A mineral property, the value of which has not been proved by exploration. (2) Non-producing mining property under development or considered worthy of such attention.

**PRP** - Potentially Responsible Party.

**Pulp** - A mixture of ground ore and water capable of flowing through suitably graded channels as a fluid.

**QA/QC** - Quality Assurance/Quality Control.

**Raise** - A vertical or inclined opening driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level.

**Reagent** - A chemical or solution used to produce a desired chemical reaction; a substance used in assay or floatation.

**Rod Mill** - A mill for fine grinding, employing long steel rods to grind the material.

**Secondary Drainage** - The secondary drainage is the smallest named stream segment/drainage that is locatable on the USGS Quadrangle Map within which the mine site is located.

**Sediment** - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, or ice and has come to rest on the earth's surface either above or below the water level.

**Sedimentation** - The settling of solid particles of soil, coal, or mineral from liquid as a result of gravity or centrifuging.

**Shaft** - An excavation of limited area compared with its depth, made for access to underground mine workings.

**Sluice (Sluice Box)** - A long trough-like box set at an incline of about 1:20 through which placer gravel is carried by a stream of water. The gravel is washed away while most of the gold or other heavy materials are caught by riffles or blankets on the floor of the sluice.

**Slurry** - Fine solid particles suspended in a liquid, typically water, of a consistency that allows flow by gravity or pumping.

**Source** - Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance.

**Specific Conductance** - The specific conductance or conductivity of water (or other substance measured) is the electrical conductance of the material between opposite sides of a cube 1 centimeter in each direction.

**Stamp Mill** - An apparatus in which rock is crushed by a stamp battery.

**Stope** - An underground excavation from which ore has been removed.

**Subsidence** - A sinking down of a part of the earth's surface due to the collapse of underlying underground openings.

**Surface Mining** - The mining in surface excavations, including placer mining, mining in open pits, mining and removing ore from open cuts by hand or with mechanical excavating and transportation equipment, and the removal of overburden to uncover the ore.

**Tailings Pond** - A pond with a constraining wall or dam to which mill effluents are run.

**Tailings** - The refuse material resulting from the washing, concentration, or treatment of ground ore.

**Tunnel** - A horizontal or nearly horizontal underground passage that is open to the atmosphere at both ends.

**USFS** - United States Department of Agriculture, Forest Service.

**USGS** - United States Department of Interior, Geological Survey.

**Waste** - The rock that is too low in grade to be of economic value.

**Waste Dump (Spoil Pile)** - The area where mine wastes or spoil materials are discarded.

**Wetlands** - Areas that under normal circumstances have hydrophytic vegetation, hydric marshes, and wetland hydrology. It includes landscape units, such as bogs, marshes, and lowlands, covered with shallow ephemeral or intermittent waters. Permanent waters of streams and water deeper than 9 feet in lakes or reservoirs are not considered wetlands.

**Winze** - A vertical or inclined opening, or excavation, connecting two levels in a mine, differing from a raise only in construction. A winze is driven downward and a raise is excavated upward.

**X-ray Fluorescence (XRF) Spectrometer** - Instrument used for metals analysis of solid media by energy dispersive X-ray fluorescence.